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CITRUS CULTURE IN VICTORIA.

(*Continued from page 654.*)

PART VIII.—DISEASES.

By S. A. Cock, Orchard Supervisor, Bendigo and Northern District.

The quantity and quality of the fruit depend on the health of the tree. If trees are starved, the fruit will drop, and the foliage assume a sickly appearance. The foliage should be of a lustrous green colour. Irrigate, cultivate, and manure. Deep-rooting trees properly irrigated have always a plentiful supply of moisture to draw upon, and the roots can perform their proper functions. Well-drained soils and suitable stocks, properly planted and cultivated, will reduce the liability to Root and Collar rot (*Fusarium limonis*), the dread gum disease of the citrus grove. This disease is more prevalent on the lemon than the orange tree. It is a very difficult disease to combat. When the roots are attacked the tree begins to die back from the top, and the foliage assumes a sickly appearance, very often before there is any manifestation of disease on the bark above the ground. Generally, the disease begins on the roots and works upward to the collar of the tree. Examination of the roots will disclose dead and decaying bark which slimes off from the woody part of the root. With badly affected trees, but little can be done. The best plan is to dig them out, roots and all. Burn every part of the tree in the hole from which it is dug, and thoroughly lime the soil before planting another tree. In a mild form, if only one or two roots are affected, and the disease has not reached the collar or butt of the tree, the affected roots should be cut off, thoroughly dug out to the extremities, and the ground where they are dug from limed. The writer's experience of this disease extends over twenty years in all classes of soils, and under all phases of culture, and the experience is that where trees are badly attacked there is no cure. Try to prevent it by planting

trees worked on suitable stocks. Have nothing to do with layers or cuttings; they are always weak and more liable to disease than seedlings, and seedlings of the lemon, as at present supplied, are more susceptible to disease than sweet orange seedlings. Nurserymen should exercise the greatest care in the selection of stock and scion, using only the fittest—strong stock and fruitful scion.

Sometimes only the collar of the tree is attacked. In this case the ruptured bark should be cut away as far as it extends to the roots, cutting back the diseased bark to the healthy green bark, and also cut away the gummy wood with a chisel or sharp knife, until the seat of gumming has been removed. This can be determined by allowing the affected portion to stand exposed for a couple of days. If gum is still oozing from the grain of the wood, as will be seen by streaks of yellow sour sap, the wound should be scraped and cut again, and so treated until the exudation ceases. When this ensues the wound should be treated with crude carbolic acid mixed with its own weight of water. It is generally safe to apply two dressings at an interval of a month, when, if the disease has been arrested, the bark will begin to grow toward the affected part. Should the trees be badly affected with Collar rot, that is, almost encompassing the butt of the tree, the tree is better dug out and burned, and the soil treated with lime. Properly drained soils are absolutely essential in guarding against Root and Collar rot.

Bark-blotch (*Ascochyta corticola*) is easily distinguishable from Collar rot, as there is no gummy exudation at the point of attack. The bark is ruptured as in Collar rot, and in the early stage of attack, if examined under a magnifying glass, numerous pustules of the fungus will be found slightly elevating the ruptured epidermis. As the disease spreads the ruptured bark lifts off from the wood, and if not checked eventually causes the death of the tree. When attacked the trees die back from the top, and put on a sickly appearance.

The treatment for the disease is to cut away the diseased bark to the healthy bark, and lightly scrape the surface of the wood, and treat with crude carbolic as recommended for Collar rot. In using carbolic acid, care should be used so that the vegetable tissues of the tree are not destroyed. The strength of commercial carbolic acid varies; therefore it is necessary to test the strength by practical demonstration. All implements used in cutting and scraping should be dipped in disinfectant after use, and all scrapings, chips, &c., should be gathered and burned, as the diseases are contagious, and may easily be carried to a healthy tree.

The Root-rot Toadstool (*Armillaria mellea*) also attacks the Citrus trees. This disease can be recognised by the black, cord-like strands of mycelium of the fungus, with its branching net-work around the roots of the tree. The branching mycelium enters the roots, and forms a felt-like layer under the bark, and in time the disease causes the death of the tree. The first symptoms of this disease is a dying back from the top of the tree, and sickly appearance of the foliage. The fructification of this fungus can be observed above ground by clusters of toadstools produced around the butt of the tree.

For the checking and eradication of this disease isolation is necessary, as the mycelium spreads through the soil in search of other victims. Trees affected with this disease should be thoroughly dug out and burned in the hole from which they are removed. A deep trench should be dug round the tree to the outermost limit of its roots, making a ring round the affected tree, and all the soil inside this ring thoroughly turned over and saturated with sulphate of iron dissolved in water at a strength of 1 lb. to 5 gallons; or sulphate of copper at a strength of 1 lb. to 8 gallons. This fungus lives as a saprophyte on dead and decaying wood, and changes to a parasite on many of our orchard trees; hence it is always necessary to clear the soil of roots and stumps of forest trees before the planting of an orchard is entered upon. The writer's experience of this disease is that it is almost impossible to cure affected trees, and the best course to pursue is, as advised, to safeguard the adjoining trees.

Wither-tip (*Phoma omnivora*).—The symptoms of this disease are the withering of the tips of the stem and leaves, or the "Die back" as it is called. Frost and cold winds may injure many shoots, but Wither-tip is recognised by the greyish-brown discoloration of the leaves, and the dark brown or blackish blotching of the twigs, and brownish-black scab on the fruit. The remedies to be applied to prevent this disease are—encourage healthy root action, cut back all diseased parts to a healthy growth, spray with Bordeaux Mixture or copper soda, burn all prunings, and avoid the use of organic nitrogenous manure, such as fresh stable manure, immediately around the tree, especially in the autumn, as this causes a soft growth of foliage particularly subject to disease.

Black Spot (*Phoma citricarpa*); Scab of the orange and lemon (*Cladosporium subfusoideum*, *Diplodia citricola*, *Sporodesmium griseum*); False Melanose (*Cladosporum brunneo-atrum*); Black Scurf (*Coniothecium*), and various fungi, such as *Pleospora disrupta* and *Diplodia destruens*, enumerated under the general names of Leaf Scab, Blister and Curl—any of these fungi may attack the Citrus grove, and all are amenable to treatment by spraying with the fungicides mentioned.

Sooty Mould (*Capnodium citricolum*) is always found in conjunction with brown and black Scale (*Lecanium*). Keep the trees free from Scale and there will be no Sooty Mould.

The fungus diseases mentioned are the chief ones the grower will have to contend with in the orchard, and he should make himself thoroughly conversant with them. *Fungus Diseases of the Citrus*, by D. McAlpine, contains coloured plates and explanations, and is obtainable from the Department of Agriculture, Melbourne. Price, 2s.

Bordeaux Mixture—

Sulphate of Copper, 6 lbs.
Fresh lump lime, 4 lbs.
Water, 40 gallons } prepared as follows—

Dissolve the bluestone in 20 gallons of water, and slake the lime into a paste, and make up to 20 gallons with water. When the bluestone is dissolved, and the lime taken up in the water, add the two together by pouring them simultaneously into a third vessel through a good strainer.

Spray on cool, cloudy days when the foliage is perfectly dry, and when the young growth on the tree has hardened. The formula given is winter strength; if using in the summer, use half the strength.

Copper Soda Mixture—
Sulphate of Copper, 6 lbs.
Washing Soda, 9 lbs.
Water, 50 gallons
} prepared as follows—

Dissolve the bluestone in 25 gallons of water, and dissolve the soda in 25 gallons of water, and mix as for Bordeaux. The summer strength is 6—9—100.

Spraying is best carried out in early August, but if the fruit is affected, then summer and autumn spraying will be necessary.

Rot, or Blue Mould of the Orange and Lemon.—This fungus is known under the name of (*Penicillium digitatum*). It is a disease only of the fruit, and is found chiefly in the packing and curing shed, and in packages of fruit. In the packing and curing sheds, or in the packages, the disease generally begins where two fruits press together, or on any bruised portion of the fruit. Navel oranges may be attacked in the orchard, the disease beginning at the navel end; it may also occur subsequent to any wound on the surface of the fruit. Under favorable conditions, the disease soon spreads. The conditions favorable to its development are moisture on the surface of the fruit sufficient to cause germination of the spores under right degrees of temperature, the range of which is extremely great, and can almost be said to be always favorable. The spores gain an entrance to sound fruit by contact with spores produced on rotting fruit. The presence of moisture on the fruit is always necessary for the germination of the spores, consequently fruit removed after refrigeration should be immediately dried by quick ventilation. Packing and curing sheds should also be thoroughly ventilated so as to carry off any moisture that may accumulate during the sweating process. The surest means of spreading this fungus is by piling diseased fruit in heaps in the vicinity of packing and curing sheds. The fruit should be destroyed by burning or burying before it reaches the blue mould stage. If fruit is wrapped in tissue paper it will be found efficient only within certain limits for preserving it from infection. When the temperature falls, the paper becomes moist, and this moisture is evaporated when the temperature rises, therefore by good ventilation the moisture will be carried off; on the other hand, should the fruit sweat, and the paper become very wet, owing to rapid decrease in temperature and bad ventilation, water will gather on the fruit; and if disease spores be present rapid germination of the spores will ensue.

In packing and curing sheds cleanliness should be the first essential. All litter and rubbish should be destroyed by burning; and the sheds, along with all boxes, trays, &c., connected with them, should be thoroughly fumigated with sulphur fumes. For this purpose the sheds should be rendered as air-tight as possible.

In the summer, when there is no fruit in the sheds, they should be thoroughly opened and exposed to the influence of hot, drying winds. Cleanliness, dry air and sunshine are the enemies of Mould fungi.

Chlorosis, or yellow and variegated leaves, is usually caused by a want of iron in the soil. Individual trees treated with sulphate of iron

in powdered form, at the rate of 3 lbs. to the tree, have done remarkably well afterwards. Iron in an available form is not always present in the soil, and a dressing every few years of 1 cwt. to the acre is of direct benefit to the grove; it enriches the colour of the fruit, and produces a deep green tint in the leaves. Sometimes there are other causes affecting the colour of the foliage, such as too free and gravelly soils, which dry out too quickly and do not retain sufficient moisture for the tree. Hardpan is another cause; also bad drainage, causing stagnation. All symptoms of disease should be inquired into immediately.

Of Insect diseases affecting Citrus trees, the Red Scale (*Aspidiotus aurantii*) is undoubtedly the most troublesome. The insect itself is very tiny, yellow to brownish in colour, and is covered with a circular flat scale, grey to red and about the size of a pin's head in the female, and red in colour and about one-third the size of the female in the male. The insect attacks the fruit leaves and bark, and the only effectual remedy for it is fumigation with hydrocyanic gas.

Black Scale (*Lecanium oleae*) is also a very troublesome insect; it is called the olive scale, and is very injurious to the olive tree, also the oleander. These trees, should they be growing near an orange grove, should be watched; and if scale is found, they should be treated by fumigation or sprayed with a scalecide. The olive scale is dark brown, almost black in colour, and hemispherical in shape, and attacks the leaves and bark chiefly. The secretion from the Scale (Manna or honeydew) is always indicated on infested trees by the black discoloration on the leaves, bark and fruit. Fumigation or spraying with resin wash will be found effective, and should be carried out in February or March, when the young scales are appearing. Dense foliaged trees are always more infested with Scale than trees with well-spaced branches, open to the admission of light and air. There are other varieties of *Lecanium* affecting Citrus trees; also the Cottony Cushion Scale (*Icerya Purchasi*) is sometimes met with. The same treatment is recommended for all. Trees affected with Scale soon become unprofitable.

Resin Wash—

Resin, 20 lbs. Caustic Soda (70 per cent.), 7 lbs. Fish Oil, 3 pints	prepared as follows—

Water, to make 100 gallons

Place the resin, soda and oil in a boiler and add 20 gallons of water, and boil thoroughly over a brisk fire for about three hours, then add hot water occasionally, and keep stirring the mixture until diluted or made up to 50 gallons of hot mixture. Place this in the spray vat and add cold water to make up to 100 gallons. Cold water is not used while preparing the mixture. Keep the mixture well agitated while spraying, and use long gloves over the hands and arms. After using resin wash, all vessels, spraying machines, and nozzles should be washed out with cold water to prevent clogging for future use.

Hydrocyanic Gas—

Cyanide of Potassium, 98 per cent., 1 oz. by weight Sulphuric Acid (Common commercial), 1 oz. fluid Water, 2 oz. fluid	generated and used as follows—

to every 180 cubic feet of space.

The ingredients are placed in a glazed earthenware or enamel vessel of fair size, and the tree covered with an air-tight tent to hold the fumes generated.

Briefly, the method is as follows:—The tree is first covered with the tent, and the edges secured on the ground by covering with earth. On the windward side, the operator places the generating vessel under the tent, and places the water in the vessel, then the sulphuric acid is slowly added, and last of all the cyanide; the tent is secured, and the fumes allowed to generate for about 45 or 50 minutes. This work is best carried out at night, or on cool, cloudy days. The foliage of the trees must be perfectly dry, otherwise burning will result. Simultaneously with dropping the cyanide in the generating vessel, a piece of bagging should be thrown over the vessel to spread the fumes, and prevent burning of the foliage immediately above the vessel. Cyanide should be used in coarse pieces; the coarser it is the more gently the gas is generated. If used too fine, the gas in generating spatters the ingredients outside the vessel. Hydrocyanic gas is a deadly fume, and great care should be exercised in its use. A complete article on quantities, tents, and size of trees, appeared in the June *Journal of Agriculture*, 1912, and growers would do well to procure this publication; also get an experienced officer of the Agricultural Department to instruct them in the use of the gas.

Orange Aphis (*Siphonophora? sp.*).—This insect attacks the young tender shoots of the orange and lemon, causing them to wither, turn black and die off. The insects vary in colour, being greyish or dark brown and olive green colour in the wingless stage, and in the winged stage dark leaden grey, with the under wings clear and the upper wings with faint orange-coloured markings. Like all aphides, they multiply rapidly, and in some seasons do a lot of damage to the young growth of the trees. Spraying with Tobacco wash will be found effective in combating this pest, and it should be sprayed for as soon as observed.

Tobacco Wash—
Refuse tobacco, 1 lb.
Cold Water, 4 gallons } prepared as follows—

Soak the tobacco in the water for two days, stirring occasionally, then strain off the nicotine water and spray. In order to render the nicotine water adhesive, it will be found beneficial to add 1 gallon of water in which 1 lb. of common starch has been dissolved.

In spraying for disease, use pumps provided with good agitators, so that the insecticides and fungicides will be in a constant state of agitation; this will insure proper mixing of the ingredients.

The orchard must be kept clean to procure the best results, and attention to details, along with methodical management, will greatly minimize the risk from disease, both insect and fungi.

BEE-KEEPING IN VICTORIA.

(Continued from page 660.)

By F. R. Beuhne, Bee-Expert.

XIX.—UNCAPPING COMBS.

Before the honey can be extracted from the combs of the modern frame hive, the wax caps with which the bees have covered the cells of

Fig. 1.—Uncapping Combs into Simple Melter.

honey have to be removed. This is done by means of what is known as an uncapping, or honey, knife—a stout knife 8 to 12 inches in length with two cutting edges, bevelled from one side, and an off-set handle. To uncap quickly and without damaging the combs, the honey knife should be as sharp as a razor and must be kept in hot water so that it will easily pass the comb surface on one side and the sheet of cappings on the other. Two knives may be used with advantage, so that while the operator is working with one, the other is getting hot for the next comb. There are several different knife-heaters, one of which, seen in the illustration (Fig. 3), is heated by a small lamp. When a cappings melter is used, a

separate knife-heater is not required, the knives being hung into the hot water of the apparatus as shown on the left in Fig. 2.

The uncapping of the combs and the extracting of the honey should be done as soon after the combs are taken from the hive as possible, if the weather is at all cool, unless a warm room is available in which to

Fig. 2.—Uncapping into Patent Cappings Reducer.

keep them. Combs uncap and extract best at the temperature they are in a hive crowded with bees.

There are different ways of uncapping combs, cutting upwards or downwards, crossways of the frame or lengthways; but in each instance the bevelled edge of the knife is towards the comb, the severed cappings

passing over the broad face of the knife. The majority of operators use the upward stroke; the frame is placed on end over the cappings receptacle, the knife is started at the lower side bar of the frame and with a slightly sawing motion drawn upwards, the top and bottom bars of the frame acting as a guide to the bevel of the knife, if a long one is used.

Fig. 3.—Uncapping Can. Wrong way of holding Comb.

To prevent the severed cappings falling back against and sticking to the surface of the comb, the frame should be tilted slightly forward, as in Fig. 2. Before returning the knife to the hot water it should be drawn across the edge of the wooden frame support to free it of honey and wax. The hand holding the frame should be kept back behind the wood of the

frame, as in Fig 1, to prevent cutting it should the knife slip at the end of the cut. Uncapping, as in Fig. 3, is likely to result in damage to one's fingers. To keep the honey knife in good order, the edge used for uncapping should not be utilized for trimming burr combs off top or bottom bars where nail-heads are likely to be met. The knife should not be left in the heating water during intervals in the work; and when being sharpened should be ground from the bevelled side only, and brought to a fine edge with an oil-stone.

A receptacle into which the cappings drop as they are shaved off the combs is necessary. The simplest form consists of a vessel with a perforated bottom through which the honey drains into a lower receptacle. For larger apiaries a trough, with a perforated false botton an inch above the real one, and a honey gate at one end, will be found more serviceable. It should be large enough to hold the cappings of a day's work, as they

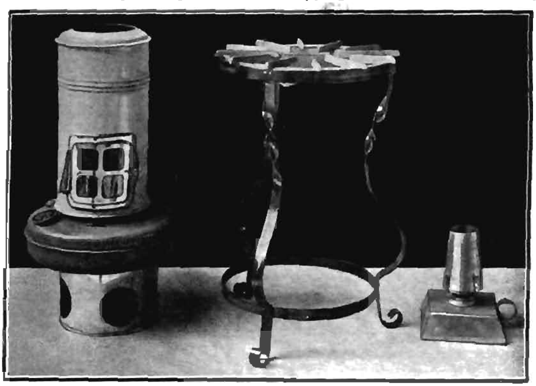


Fig. 4.—New Perfection Oil Stove for Heating Capping Melters.

drain very slowly; they should be broken up and worked about now and again to hasten draining. In Fig. 3 an uncapping can is shown, the honey from the cappings drains through a wire screen and is drawn off through a honey gate at the bottom.

Even when allowed to drain for several days, a considerable amount of honey remains in the drained cappings, and although this is recovered when the material is melted down for wax, it is dark in colour and of a waxy flavour. The drained cappings are usually transferred to the solar wax extractor, a tin-lined box covered with a pane of glass facing the direct rays of the sun, and in which the wax melts and liberates the honey. Cappings are, however, awkward and slow to handle, and as the solar extractor does not work on cloudy or hazy days, accumulations occur during the busy season. By means of cappings melters, all handling of this sticky material is dispensed with, the cappings are melted as fast as they are sliced off, and honey and wax separated.

Several different types of reducers, as cappings melters are called, are on the market. The simplest form is that shown in Fig. 1, and consists of two metal cans, one inside the other, with a space for water between them. It is heated from the bottom by a kerosene stove placed under the stand, a double wire screen prevents unmelted wax escaping by the outlet gate, while the honey knife is kept hot in an opening between the inner and outer can. Honey and wax flow out into the receiving vessel together, and separate owing to their different specific gravity. The wax is allowed to set on top of the honey, and thereby imparts a flavour to the latter. This apparatus is known as the "Simple Cappings Melter."

For apiaries of fifty colonies and over it is best to have the "Patent Cappings Reducer," illustrated in Figure 2. It is composed of an outer and an inner metal casing forming a jacketed space for water between the two. Two opposite sides are connected transversely by square tubes set $\frac{1}{8}$ inch apart forming a grid. This apparatus is made of copper, which is tinned where it comes in contact with honey or wax, while it is encased in wood to conserve heat. It rests on an iron stand, and is heated by a kerosene stove. The cappings, as they leave the honey knife, fall on to the grid of tubes, on which they quickly melt in contact with the hot metal, the resulting liquid passing through between the tubes into the receiving tray in the lower part of the machine. This receiver is made of stout tin, in the shape of a drawer, with a board front. At its lowest point it connects with an elbow swivel tube on the outside, which is set to the correct elevation to keep the level of the liquids in the tray slightly below the wax outlet tube on the upper part of the receiver. Before commencing work sufficient honey is put into the receiver to cover the end of the honey tube inside the tray. As liquid wax and honey accumulate, and the level of the upper and outside end of the tube is reached, honey will commence to flow from the elbow tube, while the liquid wax, owing to its lesser specific gravity, floats on top of the honey, and gradually rising overflows into a mould placed underneath the wax outlet tube in front of the machine.

The elevation of the honey tube should be such that while a continuous overflow of honey and wax is maintained during uncapping of combs, both liquids should run from the machine free from impurities, the dross, of which there is a considerable quantity when old black combs are uncapped, should remain in the tray. Before uncapping the last super of combs the honey-tube may be slightly raised to force as much wax out of the wax tube as can be got out clean; when all the cappings have disappeared through the grid the honey tube is gradually lowered, and the honey allowed to run till the first indications of impurities appear, when it is turned up. The cake of dross, which still contains a little wax, is removed from the tray when cold, sufficient honey generally remains to cover the end of the honey tube ready for further work. From what has been said, it will be seen that the well-known U tube principle is employed to effect continuous automatic separation of liquids of different specific gravity; the receiver representing one arm of the tube and the elbow tube the other.

A stove is needed to keep the water in the machine at boiling point. A Primus stove may be used, but, while it will work quickly, it will give rather too much heat when used in full blast, and requires occasional pumping up and pricking. The New Perfection Blue Flame Oil Stove,

illustrated in Figure 4, will be found the most satisfactory means of heating cappings melters. It takes somewhat longer than the Primus stove to bring water to the boiling point, but the heating power can be adjusted to a nicety, and, if handled according to the instructions supplied with it, requires no attention whatever. Under the Patent Cappings Reducer it is used without the iron stand supplied with it, so that the funnel may project through the circular opening in the top of the Reducer stand. Under this Reducer the stove rests on a support, as shown on the left of the illustration (Figure 4). For other purposes it is used in the stand shown in the centre.

(To be continued.)

FRUIT PROSPECTS FOR THE SEASON 1913-1914.

P. J. Carmody, Chief Orchard Supervisor.

To give some indication of the fruit crop for the season 1913-14 the reports of the district supervisors are given hereunder. The season at the outset gave excellent prospects of a good harvest, but boisterous and bitterly cold weather at the time of setting of the apples has had an injurious ffect on this particular kind of fruit. Even at the time of writing one cannot speak with any degree of certainty of the prospects; but, judging from the reports forwarded, an average crop can be looked for. In many cases striking evidence is offered of the advantage of having Jonathans mixed up with other varieties to influence their setting. The crop of apricots will be much heavier than last year, when the crop in the Goulburn Valley failed. Owing to the inclemency of the weather at setting, grave danger exists as to the freedom of the fruit from Black Spot, particularly where thorough spraying has not been carried out.

Prospects of the season's fruit crop, 1913-14, in the Doncaster district. A. A. Hammond, Orchard Supervisor—

Apples.—Good to very good. Jonathans very good. London Pippin and Rome Beauty just setting at time of writing. They promise a good setting.

Apricots.—Heavy. Not much grown in district.

Cherries.—Generally good. Early cherries light in some places.

Pears.—Medium to good. Williams' Bon Chretien light in many orchards, particularly on old trees that bore heavily last season.

Peaches.—Medium to good. Early peaches light in some orchards; very light in Wandin North.

Plums.—Medium to good, Angelina light. Generally fair crop of leading varieties.

Quinces.—Good.

Strawberries.—Good.

Prospects of fruit crops, season 1913-14. J. Farrell, Orchard Supervisor—

Bayswater.—Apples: All varieties medium to heavy. Pears: Williams' Bon Chretien, medium to light; Keiffer's Hybrid, medium; Napoleon and Howell, medium to heavy; other varieties, fair crop. Plums: Angelina Burdett, light; other varieties, medium. Peaches: Briggs' Red May and Hale's Early, light; other kinds, medium.

Blackburn.—Apples: All varieties medium to heavy. Pears: Medium to heavy. Peaches: A fair crop. Plums: Medium.

Brighton.—Apples: All varieties good. Pears: Williams' Bon Chretien heavy; other varieties, medium. Peaches: Medium to light. Figs: Medium (first crop).

Burwood.—Apples: Jonathan, medium to heavy; others, a good crop. Pears: A good crop, except in places; Williams' Bon Chretien, rather light. Peaches: Mostly light. Plums: A fair crop.

Croydon.—Apples: Jonathan has set well; Five Crown and Rome Beauty are also setting a good crop; other varieties mostly medium. Pears: Williams' Bon Chretien, medium to heavy; Keiffer's Hybrid, *medium to light*; Howell, heavy; others, a fair crop. Peaches: Light. Plums: Medium to heavy.

Emerald.—Apples: Five Crown and Rome Beauty are setting well. Jonathan, medium. Pears: Medium. Plums: Medium.

Fern Tree Gully.—Apples: Jonathan, Reinette du Canada, Yates, Esopus Spitzenberg, heavy; others, medium to heavy. Pears: Williams' Bon Chretien, heavy; Beurre Bosc and others, medium. Plums: Medium to heavy. Peaches: *Medium.*

Monbulk.—Apples: A fair crop. Pears: Light to medium. Plums: Wickson, light; Burbank, heavy; others, light to medium. Peaches: Light to medium. Nectarines: Light. Raspberries: All kinds heavy. Gooseberries: Roaring Lion heavy, as usual; others, medium to heavy. Currants: Red and white, heavy; black, light to medium.

Ringwood.—Apples: Jonathan, a good crop; Yates, Esopus Spitzenberg, Rymer, Reinette du Canada, and others, good; *Rome Beauty and Five Crown setting well.* Pears: Keiffer's Hybrid, light; Howell, Napoleon, Beurre Bosc, Beurre Capiaumont, heavy; Williams' Bon Chretien, medium. Plums: Medium to heavy. Peaches: Briggs' and Hale's Early, rather light; other kinds, medium. *Quinces:* Medium to heavy. Gooseberries: Heavy.

Scoresby.—Apples: Most kinds, medium to heavy. Pears: A fair crop. Plums: Medium to heavy.

Vermont.—Apples: All kinds, medium to heavy. Pears: All varieties, a good crop. Plums: Medium to heavy. Peaches: Light. Lemons and oranges: Medium.

Wandin.—Apples: Jonathan, medium; Sturmer Pippin, Reinette du Canada, medium to heavy; Rome Beauty and Five Crown, setting well; others, light to medium. Pears: Williams' Bon Chretien, light to medium; Beurre Bosc, Beurre Capiaumont, Beurre Clairgeau, medium; others, light to medium. Peaches: York, medium to heavy; Comet, light to medium; Briggs' Red May and Hale's Early, rather light. *Plums: Burbank, medium to heavy*; Wickson, light; also Angelina Burdett; Grand Duke, Diamond and others, mostly medium. Oranges and Lemons: Medium to light. Quinces: Heavy. Loquats: Medium to light. Walnuts: Light. Almonds: Light. Mulberries: Heavy. Figs: Light (first crop). Passion Fruit: Light. Raspberries: Owing to favorable weather conditions, will be heavy. *Blackberries:* Heavy. Loganberries: Heavy. Gooseberries: Heavy. Currants: Red and white, heavy; black, light. Filberts: Light.

Waverley.—Apples: All kinds, *medium to heavy.* *Pears: All varieties, a fair crop.* *Plums:* Medium. Peaches: Light. Lemons and Oranges: Medium.

Fruit crop prospects at Arthur's Creek, Bacchus Marsh, Diamond Creek, Kangaroo Ground, Keilor, Panton Hill, Queenstown, Research, Werribee, and Whittlesea, season 1913-14. E. Wallis, Orchard Supervisor—

Apples.—Medium to heavy, average crop; Jonathans, heavy.
Apricots.—Medium to heavy, average crop.
Cherries.—Medium to heavy, average crop.
Gooseberries.—Medium to heavy, average crop.
Peaches.—Light crop.
Pears.—Medium, average crop.
Plums.—Medium, average crop.
Quinces.—Medium, average crop.

Fruit crop prospects, Goulburn Valley, season 1913-14. A. G. McCalman, Orchard Supervisor—

Pears—

The Williams' Pear is the only variety largely grown in the district. Blossoning was almost invariably heavy, and up to the beginning of November the prospect of a heavy yield was excellent. Then, however, the bulk of the young fruits dropped. The crop will be on the light side.

Josephine de Malines.—These blossomed heavily. The yield will be good.
Vicar of Winkfield.—The yields will be fair only, crops being patchy.
Beurre d'Anjou and L'Inconnue.—These will give heavy yields.
Beurre de Capiaumont.—Show good crops, but not heavy.
Beurre Clairgeau.—Show light crops.
Winter Nelis.—Show a medium crop generally; in some cases heavy.
Gansell's Bergamot.—Show fair crops.
Reiffer's Hybrid.—Show light crops.

Apples—

Jonathans.—These will be fairly good.
Cleopatra.—These, also, will be fairly good.
Dumelow's Seedling.—These are patchy; will give a medium crop only.
Bismarck.—Show a light crop; blossom was poor.
King of Pippins.—Patchy; medium crop only.
Five Crown.—Bloom was heavy, but many blooms are falling; will be only a medium crop probably.
Rome Beauty.—Bloom was heavy; will probably be a fair crop.
Irish Peach.—Show heavy crops.
Northern Spy.—Show heavy crops.
Reinette du Canada.—Show light crops only.
Ribston Pippin.—Show medium crops.
Yates' Pippin.—Show medium crops.
Rymer.—Patchy; medium crops.
Ben Davis.—Good crop.

Plums—

French Prune.—Promise heavy yields. This is the only plum extensively grown.
Coe's Golden Drop.—Show good crops.
Pond's Seedling.—Show good crops.
Black Diamond.—Show good crops.
Early Orleans.—Show good crops.
Angelina Burdett.—Very light.
Green Gage.—Good crops.
Prune Splendour.—Good crops.

Japanese Hybrid Plums—

All varieties yielding well. *Gold, Golden Heart, Wickson,* and *Satsuma* being chiefly grown.

Cherries—

The early varieties have been harvested, giving medium yields. *Early Purple Guigne Early Lyons.*
Bedford's Prolific.—Will be heavy.
Florence.—A medium crop.
St. Margaret.—Light crop.
Twyford Biggareau.—A good crop.
Black Biggareau.—A good crop.

Quinces—

Apple Shape.—Show heavy crops.
Pear Shape.—Show heavy crops.
Grapes, including *Zante Currants* and *Sultanas.*—These all promise excellently, but the bloom is not yet out.

Summary—

Peaches.—All varieties will yield heavy crops.
Apricots.—Up to the present, the loss of fruit at stoning period is slight. The crop may be classed as good, though not heavy; Moorparks are patchy.
Pears.—The yield will be on the light side, owing chiefly to the Williams' ot setting well.
Apples.—The yield will be medium.
Plums.—The yield will be heavy for both European and Japanese arieties.
Cherries.—The yield will be fairly good.
Quinces.—The yield will be heavy.
Grapes, including *Zante Currants* and *Sultanas.*—Promise very well, but it

Prospects of fruit crops for season 1913-14. W. P. Chalmers, *Orchard Supervisor*—

Dunolly, Bet Bet, St. Arnaud.—Plums: Light. Peaches: Early, light; late, medium. Cherries: Good. Apricots: Heavy. Pears: Medium.

Amphitheatre, Elmhurst, Eversley, Pomonal, Stawell, Ararat.—Apples: Heavy. Grapes: Heavy. Pears: Good. Plums: Medium.

Horsham (Quantong and Riverside).—Apricots: Early Oullins, heavy; late, *canning, light to medium.* Peaches: Light to medium. Plums: Good. Apples and Pears: Good. Grapes: Heavy.

Prospects of fruit crops in the North-Eastern districts, season 1913-14. C. F. Cole, Orchard Supervisor—

Yackandandah and Beechworth Districts. Apples: Medium to light. Pears: Light. Plums: Light. Japanese Plums: Medium. Peaches: Medium to heavy. Cherries: Medium. Almonds: Medium to heavy. Lemons: Medium to heavy. *Walnuts: Promising well.*

Rutherglen and Wahgunyah Districts.—Peaches: Medium to heavy. Apricots: Light. Cherries: Heavy to medium. Pears: Light. Apples: Medium to light. *Plums and Prunes: Light. Almonds: Medium. Nectarines: Medium* to heavy.

Springhurst, Barnawartha, Wodonga, and Districts.—Peaches: Medium to heavy. Almonds: Medium to heavy. Apricots: Medium to light. Cherries: Medium to heavy. Pears: Light. Plums and Prunes: Light. Nectarines: Medium to heavy. *Apples: Medium to light. Lemons: Medium to heavy.*

Kiewa and Tallangatta Districts.—Apples: Medium to light. Pears: Light. Plums: Light. Japanese Plums: Medium to light. Peaches: Medium to heavy. *Walnuts: Promising well.*

Euroa and Strathbogie Districts.—Apples: Medium to light. Pears: Light. Peaches: Medium. Lemons: Medium to heavy. Plums: Light.

Most varieties of apples and pears carried a heavy crop last year. Although they showed well for this season, a light to medium crop is anticipated by growers. Plums and prunes set a light crop, although blooming well—also apricots.

Prospects of fruit crops, season 1913-14, Bendigo and Northern districts. S. A. Cock, *Orchard Supervisor*—

Apricots in all districts have set an exceptionally heavy crop, probably the heaviest on record in all varieties.

Apples promise a fair to heavy crop. All varieties have a fair *setting*, and all districts promise well.

Almonds are not largely grown commercially, but trees have set a good crop.

Cherries have set a heavy crop in all varieties at Castlemaine and Bendigo.

Currants.—Red, Black, and White have set a good crop.

Citrus.—Oranges and lemons are flowering well, and a good crop should result.

Gooseberries.—Campbell's Creek and Castlemaine are the chief districts for this fruit, and the crop is very heavy.

Grapes promise a very heavy crop at *Bendigo and the Murray districts.*

Peaches.—A heavy crop in all varieties in Bendigo and the Murray districts.

Plums.—Probably the heaviest crop known in the Castlemaine and Bendigo districts in all varieties.

Pears.—An extremely heavy crop has set in all districts; at Harcourt, Winter Nelis being probably the heaviest crop known. Gansel's Bergamot has also set a *heavy crop.*

Quinces.—A heavy crop.

Strawberries.—At Campbell's Creek and *Castlemaine a heavy crop; also* Bendigo and Rochester.

Tomatoes.—A record planting. There has been a total immunity from frosts, and the crop promises *to be a very heavy one* at Echuca, Swan Hill, Kerang, Rochester, and Bendigo.

Miscellaneous.—Loganberries, Raspberries, Loquats and Persimmons have pro*mise of good crops* where grown.

It is estimated that fully 1,500 acres of orchard trees have been planted in this district this season, consisting chiefly of citrus (oranges

and lemons), peaches (chiefly canning varieties), apples and pears (export varieties), apricots and plums, the latter including a large area of prunes. Generally speaking, the orchards are looking well, and the trees well and skilfully cultivated.

The reports from Gippsland, Somerville and the Western District show that the crops are somewhat similar to the foregoing; and in no place are they promising as heavy as the past season, when a record crop was harvested.

DIFFICULTIES IN MANAGEMENT OF CO-OPERATIVE CONCERNS.

Harold G. Powell, General Manager of the Californian Fruit-growers' Exchange, writes:—

"A co-operative organization is more difficult to manage than an ordinary corporation. In the latter, the stockholders do not often take an active interest in its management, because they are not experts in the business of the corporation. . . .

"There are two extremes in the method of managing a co-operative organization of farmers; one is a method in which the manager becomes an arbitrary dictator in developing and executing the policies of the association similar to the method in many stock corporations; in the other, the directors establish the policies and execute them through a clerical assistant. Either system is almost certain to fail in the end. Neither is founded on principles that are adapted to a farmers' co-operative organization.

"Between the two extremes lies the successful method of management. The manager who succeeds is he who holds the confidence of the directors and the interest of the members, and who shapes them into a working policy, who acts on matters of policy only after the approval of the directors, and who, at the same time, takes the initiative in the development of a progressive, constructive business policy for the directors to adopt. . . . Again, from the standpoint of the association itself, no co-operative organization can succeed if the directors are unwilling to place its business management in the hands of a strong, aggressive, thoroughly experienced, well-paid man and to carry out all of its policies through him alone. . . .

"Of all the different factors that have been contributory, no single factor, unless it is the disloyalty of the members themselves, or the meddling of the members in the duties of management, has operated so strongly against the success of farmers' business associations as the low salaried, inexperienced, incompetent managers selected by the directors to handle these organizations.

"This position is not a place to be filled by a popular local leader who has often failed in business, or who has been only moderately successful. There are many association managers of this type. They are 'good fellows,' but they often stand in the way of real progress in the co-operative movement because they have none of the elements of leadership or do not possess convictions of a kind that lead to the up-lifting of the co-operative method."—*Co-operation in Agriculture,* pp. 36-39.

INSECT PESTS OF THE POTATO.

C. French, Jr., Government Entomologist.

[This article appeared as an appendix to Mr. D. McAlpine's *Handbook of Fungus Diseases of the Potato in Australia and their Treatment.*]

Introduction.

Many of the insect pests of the potato known to science are found in Victoria, though, fortunately, we have not the dreaded Colorado beetle and some others which are prevalent in America and elsewhere. With the careful inspection and quarantine in Melbourne of all potatoes arriving from abroad, growers have now less fear of new pests being introduced. Should any such appear it would be advisable to at once send specimens to the Department of Agriculture, in order that action may be taken for its suppression.

Many native insects whose natural food is being destroyed as new land is brought under cultivation are turning their attention to the potato and other crops, so growers should always be on the alert. With the modern outfits, the spraying of crops is now an easy matter, and most of the chemicals used are obtainable at a reasonable price.

Most of the insects described in the following pages are known to growers, and on this account their technical descriptions have been curtailed.

THE POTATO THRIP.

(*Thrips tabaci*, Lindemann.)

During the last few years these destructive little insects (probably introduced from Europe) have caused growers considerable losses, and they are unfortunately on the increase. They attack plants of all kinds.

If *débris* in sheltered places is examined during the winter months, the thrips will occasionally be found in great numbers. They are very slow in their movements, and a severe winter is the means of lessening their numbers considerably as they cannot stand cold wet weather.

Where they have survived the winter the first warm day in October brings them out. They then appear in millions as if by magic. If the potato leaves are examined underneath the thrips will be found in all stages of development. The lower leaves of the plant are generally attacked first, and, as these are destroyed, the top ones are affected in turn. In a short time the whole plant shrivels up, and the potatoes are often only the size of marbles.

In Victoria the life cycle of these insects is as follows:—Development of egg, 3 to 4 days; development of larva, 7 to 10 days; development of nymph, 4 days; total development, 10 to 15 days. In other countries they have taken as long as 47 days to develop. Should the weather be warm, the eggs will of course develop more quickly than in cold weather. They are deposited in slits or other well concealed positions on the stems and foliage.

Prevention and Remedies.

The thrip pest is indeed a serious one, and growers will sooner or later be compelled to take united action against it, otherwise it will be almost impossible to grow good crops.

All *débris*, such as dried potato plants, weeds, &c., on potato fields should be gathered up and burnt. By this means the hibernating insects and their eggs will be destroyed.

During 1910, Mr. G. Seymour, Potato Expert, and the writer carried out some experiments at Romsey against thrips. A Strawsonizer spraying outfit was used. This was fixed in a dray and worked very satisfactorily, the spray being forced up under the leaves so that the plants received a good soaking. Tobacco water was used with good results. This wash requires careful straining, otherwise it is liable to choke the nozzles of the pump, and that would leave many plants unsprayed. The formula for tobacco wash is as follows:—Steep 1 lb. of tobacco in 1 gallon of hot water, and allow it to soak for 24 hours; boil 1 lb. of soap in 1 gallon of water until the soap is dissolved; strain the tobacco water into the soap water; stir well, and make up to 5 or 6 gallons. Use waste stems of tobacco.

Benzole emulsion, a cheap preparation, costing about 4d. per lb. wholesale, has proved very effective. One lb. makes 5 or 6 gallons of spray, and every insect reached by this mixture is killed at once. Now that many motor spray pumps are on the market, the work of spraying can be done thoroughly and in a short space of time.

Hellebore or a weak kerosene emulsion, has also given good results as a spray fluid. In America the use of lime in the following proportions has been highly recommended:—35 lbs. of lime to 100 gallons of water. In other cases, a stronger spray using from 50 to 75 lbs. of lime to 100 gallons of water was used with the best results.

The potato thrips and its control has been the subject of experiments conducted in America by Mr. Dudley Moulton. The results are detailed in Bulletin 80, published by the United States Department of Agriculture. Thrips which attack other kinds of plants and trees may be combated by the same remedy which he gives for the potato thrips. From an extensive series of trials of various kinds of spray fluid, Mr. Moulton comes to the conclusion that, though tobacco leaf extract, one part to 50 of water, is very successful, yet a more penetrating and hence more effective material is got by making up the tobacco leaf extract with an oil instead of with water only. The oil spray is forced more easily than the water spray into the buds, and penetrates more readily the oily covering of the insects themselves. The oil spray recommended is composed of:—Distillate oil emulsion, 1½ to 2 per cent. solution; black leaf-tobacco extract, 1 part to 60 parts of water. The distillate oil emulsion is prepared as follows:—Hot water, 12 gallons; white oil or fish oil soap, 30 lbs.; distillate oil (23 degrees, Baume), 20 gallons. The soap is dissolved in a kettleful of boiling water, and poured into the spray tank; the oil is then added, and the mixture is agitated violently, and sprayed under a pressure of 125 to 150 lbs. into other barrels. This stock solution is diluted before use with 24 gallons of water to each gallon of solution.

As a deterrent against thrips, spraying with coal-tar water has been recommended. The formula is as follows:—Boil 1 lb. of coal-tar in 2 gallons of water, and, while hot, add from 50 to 100 gallons of water.

Several of the accompanying illustrations have been reproduced from *The Destructive Insects of Victoria*, by C. French, F.L.S., F.E.S.

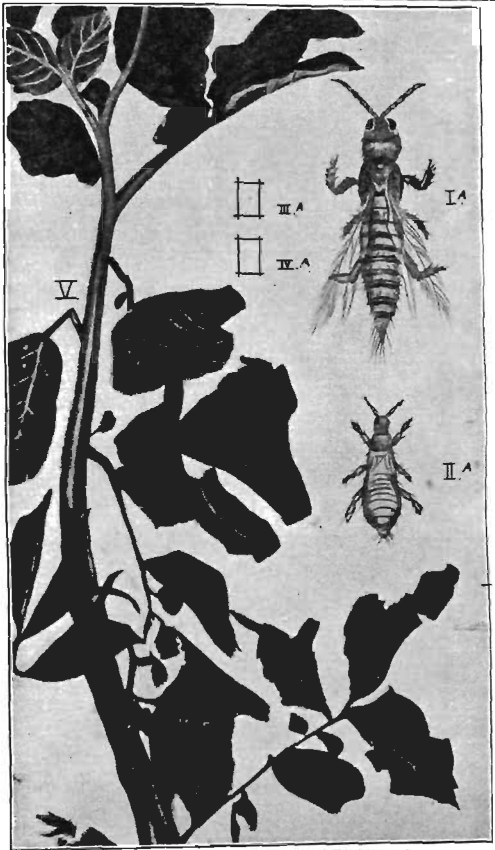


Plate I.—Potato Thrip (thrips tabaci Lindemann).

EXPLANATION OF PLATE.

Fig.
IA. Female. Perfect insect. Magnified.
IIA. Perfect insect. Magnified.
IIIA. Perfect insect. Natural size.

Fig.
IVA. Larva. Natural size.
V. Potato stem, with foliage dying. Natural size.

Cut Worms and Looper Caterpillars.

These include a number of different but closely allied species variously known as Cut Worm Caterpillars, Looper Caterpillars, Army Worms, Take-all Grubs, &c.

Plate No. 2 shows some of the common cut worm moths, also two other species of closely allied Noctuids (night moths). In the Museum of Economic Entomology and Ornithology of this Department are specimens of all the Victorian Cut-worm moths, their eggs, and larvæ. The collection may be inspected by all interested.

Of those shown in the plates, the Silvery Moth (*Plusia argentifera*) is at times destructive to potato crops in many parts of Victoria. Complaints from growers have also been received regarding the *Agrotis* (several species), Potato Looper Moth (*Plusia verticillata*), *Heliothis armigera*, *Leucania* sp., and others. The cut worms are the larvæ of these insects, and every year they are the cause of much destruction on farms, vineyards, and gardens. Wheat, oats, barley, maize, vines, plums, tomatoes, onions, beans, cabbages, and potatoes are all subject to attack.

Life History.

Closely allied as they are in their habits of life, differences between individual members of this group are chiefly morphological. There are at least two broods of cut worms in a season, but further observations will be necessary before the number is finally ascertained. The moths usually fly about at dusk, and deposit their eggs on any suitable plant. The eggs hatch in a few days, and the young cut worms begin to feed at once, any kind of green food being greedily eaten by them.

The cut worms vary in colour according to the species. Those of the Tomato Moth vary from green to yellowish, but most of the *Agrotis* are of a dirty greyish or light-brown colour, without hairs or spines, smooth, and greasy looking, often being of a similar colour to the ground in which they hibernate. Some of the cut worms feed both day and night; others rest during the day just under the soil, or under logs, stones, bark, bags, and rubbish, and feed only during night.

They are fully grown in a couple of weeks, and are then ready to pupate. The pupa is of a dirty reddish-brown colour, sometimes almost black. After pupating, they remain in the ground, from ten to fifteen days during warm weather, before the moths emerge; in cold weather the period is much longer.

Remedies.

By the eradication of weeds and the burning of haulms and stems of harvested crops the cut worm evil may be greatly minimized, as by this means many eggs are destroyed.

Growing crops may be treated in the following manner:—Place between rows of an infested crop or at short distances apart, bundles of any succulent weed or vegetable which has been previously poisoned by dipping it into a strong mixture of Paris green, 1 oz. to a bucket of water. The cut worms eat the poisoned plants, bury themselves and die. In hot dry weather the bundles should be put out after sundown. Correspondents have frequently inquired whether there is any likelihood of vegetables absorbing Paris green from bundles when

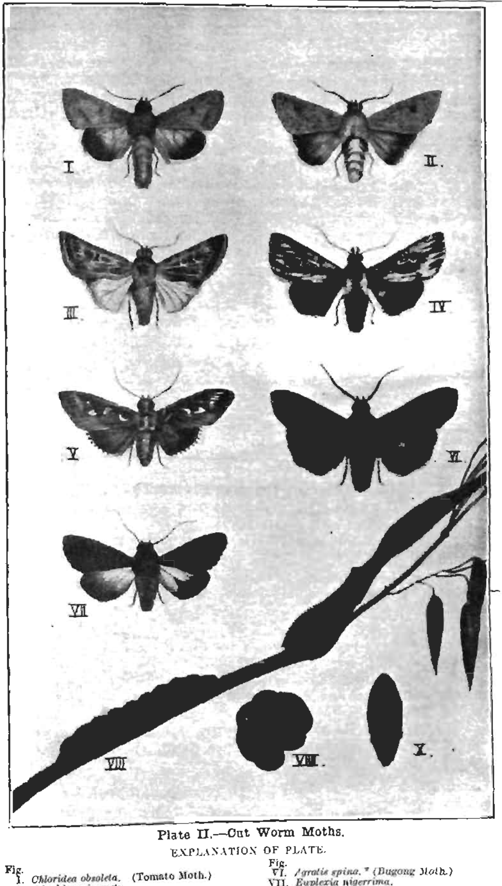


Plate II.—Cut Worm Moths.

EXPLANATION OF PLATE.

Fig.
I. *Chloridea obsoleta.* (Tomato Moth.)
II. *Cirphis unipuncta.*
III. *Euxoa radians.*
IV. *Persectania ewingi.* (Climbing Cut Worm.)
V. *Plusia argentifera.* (Silvery Moth.)

Fig.
VI. *Agrotis spina.* * (Bugong Moth.)
VII. *Euplexia nigerrima.*
VIII. Larva of *Agrotis.*
IX. Larva curled up.
X. Pupa of *Agrotis.*

(Natural size.)

placed near the roots. I am assured by the Chemist for Agriculture that there is no danger, as Paris green is practically insoluble, and therefore cannot be absorbed by plants.

The poisoned bran mash has also been successfully tried, especially against the Silvery Moth, the larvæ of which are so destructive to potato crops. In preparing the mash use one part, by weight, of arsenic, one of sugar, and six of bran, add sufficient water to make a wet mash. The mixture is usually made in a wash tub or half barrel. This is filled three-fourths full with dry bran, and there is added about 5 lbs. of arsenic, which is thoroughly stirred through the bran with a spade or shovel; 5 lbs. of sugar are next placed into a pail, water is added, and the sugar stirred until it is dissolved. The sugar water is then added to the bran and arsenic, and the whole well stirred. More water is added, and the stirring continued until every portion of the mash becomes thoroughly saturated. The mixture should be placed around and through the crop, or at the foot of the tree, plant, or shrub infested, dropping it in the shade when this can be done. Both of these preparations should be kept out of the way of children and domestic animals.

With regard to the efficacy of the poisoned bran mash, I have recently received the following letter from Mr. G. Ray, of Lindenow, Gippsland:—

> The cut worms were very prevalent this season, but I have had great success in destroying them. I had a crop of English barley, and, thanks to the use of the bran mash, I have just thrashed from 40 to 70 bushels per acre. The caterpillars were two or more inches deep in shady places, and I am sure that I would not have had any returns unless precautions had been taken.

Mr. C. W. Malley, Eastern Province Entomologist in South Africa, reports excellent results with poisoned baits. He says:—

> It occurred to me that by cutting up all available green stuff (lucerne, barley, forage, rape, young succulent weeds, &c.) into small bits, say half-an-inch in length, it could be moistened with the poisoned sweet and then scattered broadcast over the lands with least labour and material. In this way it is distributed evenly, and at such frequent intervals, that the cut worms are practically certain to find it before they do the plants. Their fondness for sweets induces them to fully engorge themselves with the bait, a fact which makes their destruction certain. There is also no danger to stock, for the pieces of bait are so small that nothing but poultry can pick them up, and it is not likely that even they will get enough to injure them. But, as a precaution, they should be kept from the lands where bait has been spread.

During the past six months several additional experimental tests have been made with cut worms, and with satisfactory results. I see no special difficulty in the way of applying the following remedy on a large scale to lands planted with tobacco, maize, or other crops, and therefore call attention to it for the benefit of any who may have occasion to use it:—

Method of Preparation.

Arsenate of soda	1 lb.
Treacle or brown sugar	8 lbs.
Water	10 gals.

Dissolve the arsenate of soda and the treacle in the water. In the meantime cut up lucerne, or other green stuff into small bits, and then moisten it with the poisoned sweet. Be careful not to make it too wet, or it will not scatter well when broadcasting. For the best results, the bait should be distributed a few days after the ground has been

ploughed, and all green succulent vegetation destroyed. The cut worms that are not injured in ploughing will then be on the surface again, and on account of their long fast, practically all of them will be prowling about in search of food. In this way, one application will probably be sufficient. If injury is noticed after the young maize plants appear, the application should be repeated.

Where a spray is employed in place of poisoned bait, arsenate of lead has proved one of the best. By using this spray, growers in the Frankston and Cheltenham districts have saved their potato crops from the ravages of the Silvery Moth. Where cut worms are feeding in grass paddocks adjoining crops, it is advisable to spray a strip of the crop. After devouring the grass they move on to the crop, and, when they come to the sprayed portion, devour it greedily, and are soon

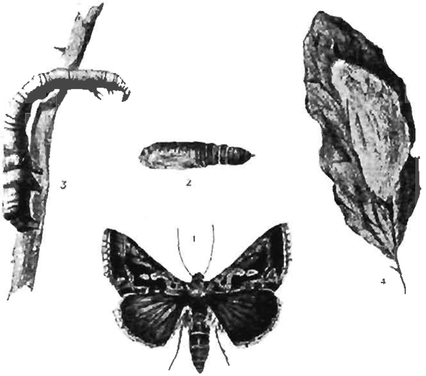


Plate III.—Potato Looper Moth (*plusia verticillata*) **(after W. W. Froggatt).**

1. Adult Moth. 2. Pupa. 3. Larva. 4. Cocoon.

destroyed. If vegetables are sprayed it is advisable to thoroughly wash them before using.

The trench system is a simple and effective method of eradication. A trench or furrow should be either ploughed or dug around the crop towards which the cut worms are feeding. It must have clear cut sides; those nearest the crop should be undercut so as to prevent the cut worms from crawling out of the trench. Deep holes should be made in the trench at intervals of, say, 5 yards. When travelling towards the crop the cut worms fall into and crawl along the trench and ultimately into the holes. A few shovelfuls of earth, well rammed, will then speedily destroy them. Should the pest be already in the crop, it may be useful to run a few furrows through it to prevent it spreading.

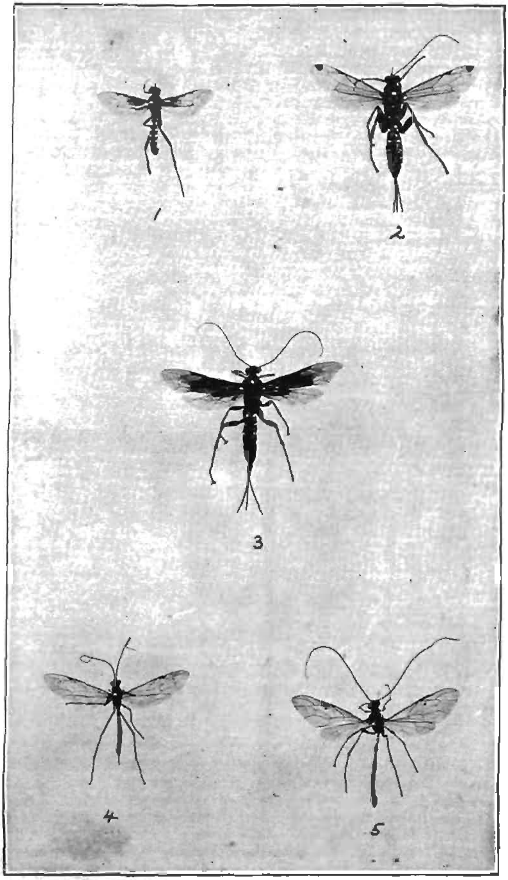


Plate IV.—*Ichneumons.. (Dark winged Ichneumon.)*

Beneficial Insects. Destroyers of Potato Insect Pests.

EXPLANATION OF PLATE.

Fig. Fig.

Another plan that answers well is to place a flock of sheep in the infested paddock adjoining the grass crop. The constant walking about of the sheep will destroy many cut worms.

If cut worms are prevalent in gardens, rake the ground up close to the plants. By this means many of them are turned up, and if poultry are allowed to run over the ground very few will escape their notice. They are also easily injured by the rake, and are then likely to be eaten by ants and insectivorous birds when exposed on the surface of the ground.

Numbers of cut worms are destroyed by hymenopterous and other parasites. Very wet and cold weather also keeps them in check.

POTATO MOTH.

(*Lita solanella*, Boisd.)

According to various writers this destructive pest of the potato crop has been known in Australia since 1854, and has spread to all the States. It has caused considerable losses to growers, and is certainly the worst potato pest in the Commonwealth.

Potato moths are usually more plentiful after a mild warm winter. There are two broods of moths. The first, the winter brood, may destroy the young plants and thereby ruin the crop. The moths of the second brood deposit their eggs on the potatoes themselves when the tubers are stored or are in the field. Occasionally, especially if potatoes are grown in stiff soil, the moths will crawl down the cracks in the ground and deposit their eggs on the tubers. The eggs are usually from 20 to 30 in number, and hatch in from six to ten days. In sandy soil tubers are rarely so attacked. The young grubs, when hatched, usually feed upon the eyes of the potatoes; they then tunnel towards the centre of the tubers, causing them to become brownish-black, and inducing decay. Sometimes when the potato plants are fully grown the female moth deposits her eggs on the leaves. The young grubs feed on these, and afterwards gnaw their way down the main stalks, reaching the tubers below. Fortunately for growers the chrysalids of the potato moth are attacked by parasites, bacterial diseases, and climatic influences, which destroy great numbers.

Life History.

Eggs.—Very minute, of a white colour and glistening.

Caterpillar.—When fully grown it measures about ½ inch long, and is of a faint pinkish colour, with a brown head. It usually pupates under the skin of the potato, and is surrounded or protected by dirt, excrement, &c.

Chrysalid.—The pupa or chrysalid is dark-brown in colour, and is enclosed in a silken bag or cocoon.

Moth.—The moth is small, of a light brownish-grey colour, the size being:—body, about ¼ inch in length; front wings, which are darker than the hind ones, female, about ½ inch across when expanded, male slightly smaller. The wings of both sexes are feathery or fringy, but this is not so pronounced in the male as in the female.

Prevention and Remedies.

Dead potato plants, discarded and small potatoes, and rubbish should be gathered and burnt. Old sacks and cases in which there

have been infected potatoes should be dipped into boiling water. By this means any grubs and chrysalids secreted in them will be destroyed.

Seed infested with the grubs should never be planted, nor should ground where moth-affected potatoes were grown the previous year be used again for potatoes. Plant the seed deep, and keep it well covered. The ground should be pressed firmly down, and it would be advisable to till it a second time. Never leave potatoes exposed in the field. When they are dug up they should be at once bagged and removed to the storeroom, where they must be placed in bins, pits, or any other receptacles where moths cannot get at them to lay their eggs in the eyes of the tubers. It is a common practice with many growers to simply heap the potatoes up in the storeroom without any covering, and to leave the doors wide open. It is no wonder that considerable losses occur.

Trapping by means of lamps is of use in destroying the moths, which fly about at night. Procure an ordinary tin basin, and in this place a brick and enough kerosene to reach half-way up the brick, and on the brick a lighted lamp. The moths are attracted to the light, and, flying against the lamp, fall into the kerosene, which kills them. The basin could be placed on an ordinary box, such as a kerosene case. Several of these lamps could be placed in a field of potatoes at night time.

When the moths commence to make their appearance, it is advisable to spray the crop with some arsenical spray, such as arsenate of lead. This will destroy the young grubs as soon as they commence to feed. A good arsenical spray is prepared as follows:—Boil 1 lb. of white arsenic and 2 lbs. carbonate of soda (crystals) in ½ gallon of water for twenty minutes. Separately dissolve 7 lbs. of arsenate of lead in 1 gallon of warm water. When both mixtures are cold mix them together. Bottle into twelve 1-pint bottles, and use one bottle to 30 gallons of water. Mix the chemicals in wooden buckets.

As many reliable brands of arsenate of lead are now on the market, and at a fairly cheap rate, the majority of growers may prefer to purchase the ready-made article instead of going to the trouble of mixing this excellent spray mixture themselves.

In cases where spraying is expected spaces might be left between every few rows of potatoes for the horse drawing the spray pump to pass, otherwise many of the plants will be trampled down. During a recent spraying demonstration on potatoes, this oversight on the part of the growers was very noticeable. At the present time some excellent motor, automatic, and other spray pumps, specially designed for potato spraying, are on the market, the nozzles being made so that the whole plant may be thoroughly sprayed. Six or more rows of potatoes can be sprayed at the same time. Recent experiments by the writer and other officers of the Department proved the value of these pumps, which are now coming into general use.

As the potato moth is proclaimed an insect pest under the Vegetation Diseases Act, it would be advisable that the potato inspectors should inspect all storerooms in the country districts where potatoes are grown, and see that every precaution is taken by growers to protect the tubers from the ravages of this moth. One careless grower in a district can breed enough moths to ruin all his neighbours' crops, and it is against such a grower that action should be taken.

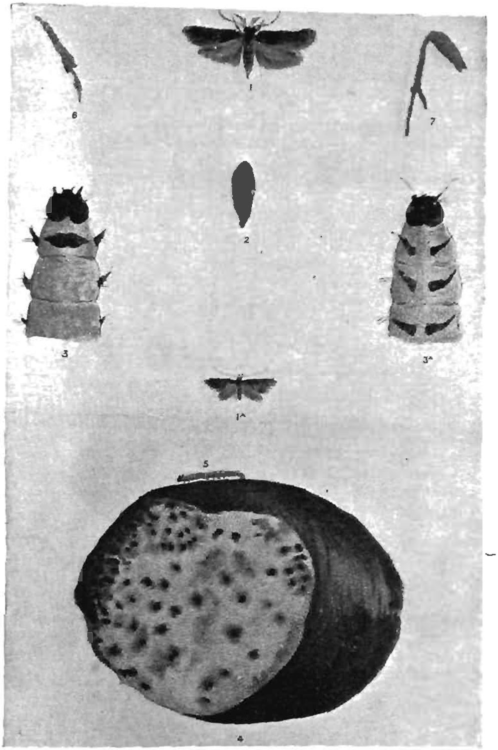


Plate V.—Potato Moth. (*Lita solanella, Boisd.*)

EXPLANATION OF PLATE.

Fig.
I. Moth. Magnified.
IA. Moth. Natural size.
II. Pupa. Magnified.
III. Head and first three segments of larva. Upper side. Magnified.
IIIA. Head and first three segments of larva. Under side. Magnified.

Fig.
IV. Potato sliced to show effect of attack by larvæ of moth. Natural size.
V. Larva. Natural size.
VI. Fore leg. Moth.
VII. Hind leg. Moth.

POTATO AND TOMATO WEEVIL.

(*Desiantha nociva*, Lea.)

This is a comparatively new pest of the potato, and was first reported in December, 1908, from the Essendon district. Here it caused young potato and tomato plants to fall to the ground by eating the stems through at the base. It has now been found in many parts of Victoria, extending right into the Wimmera district. Like many other native insects it has forsaken its natural food, probably some of the native Solanums, and taken to potatoes and tomatoes. Various vegetables and garden plants are also attacked by it.

The larva is of a light pea-green colour, and measures about a quarter of an inch in length. In the daytime it is usually found in the soil a few inches below the surface. When about to pupate it constructs a cocoon made of soil, where it remains for a couple of months until it emerges as the perfect beetle.

The beetle, which measures about a quarter of an inch in length, varies in colour from light-grey to dark-brown. Some specimens have a V-shaped mark on the wing cases, and two projections, one on each side of the wing cases. It is quite as destructive as the larva, and, like it, goes down into the soil in the daytime, and comes up to feed at night. The larvæ often feed in the daytime as well as at night, but the perfect insects rarely do so. It is a prolific breeder, and every possible means should be adopted to prevent its spread. It may be seen at all times throughout the year, and the damage done is considerable.

Prevention and Remedies.

All weeds, especially marshmallows, on land adjoining potato crops should be destroyed. This insect will eat almost any kind of weed, so it is necessary that these precautions be taken. Fortunately, in the arsenate of lead spray we have an excellent remedy for this pest. Experiments carried out by this Branch prove that by this means it can be kept in check.

JASSIDS, LEAFHOPPERS OR FROGHOPPERS.

These are small greenish-yellow insects, not unlike miniature cicadas, and about the size of the aphides on roses. They are very active, and can be seen in thousands on the leaves of all kinds of plants, now and again doing damage to the young shoots and foliage. Large numbers are often seen on potato plants.

These insects do not seem to cause any noticeable damage, but, as they appear to be on the increase, it would be as well for growers to keep a strict watch for them. If found causing any damage it would be necessary to spray the crop with Benzole emulsion, 1 to 5 gallons of water.

THE RUTHERGLEN BUG.

(*Nysius vinitor.*)

This is one of the many plant bugs found in Victoria, and it is probably the most destructive. The perfect insects measure about 1½ lines in length, the general colour being greyish to light brown; the wings,

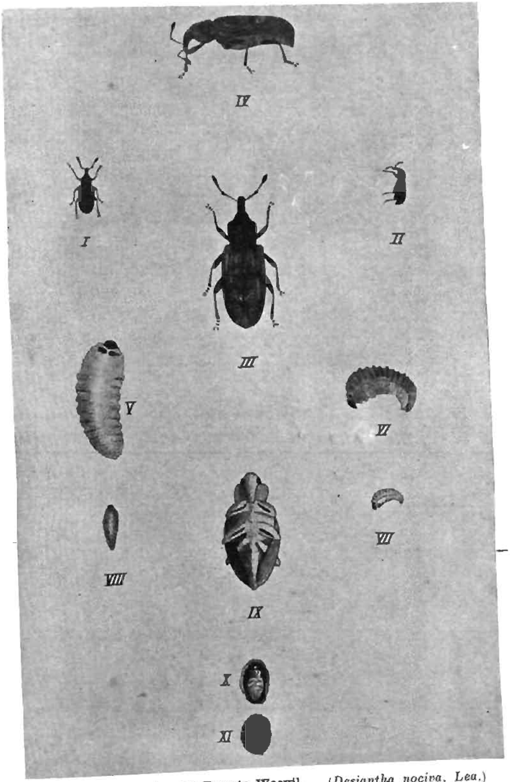


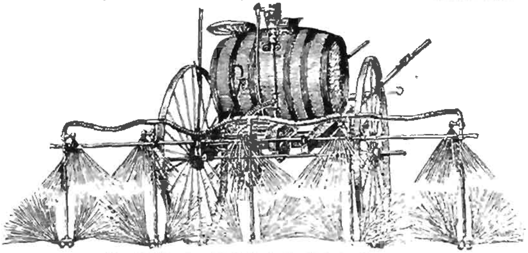
Plate VI.—Potato and Tomato Weevil. (*Desiantha nociva, Lea.*)

EXPLANATION OF PLATE.

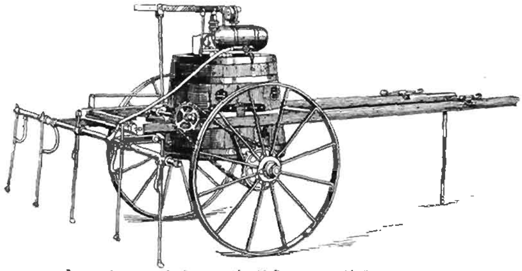
Fig.
I. Perfect insect. Natural size.
II. Perfect insect. Natural size. Side view.
III. Perfect insect. Enlarged
IV. Perfect insect. Enlarged. Side view.
V. Larva. Enlarged.
VI. Larva. Enlarged. Side view

Fig.
VII. Larva. Natural size. Side view.
VIII. Larva. Natural size. Side view.
IX. Pupa. Enlarged.
X. Pupa in cocoon. Natural size.
XI. Cocoon. Natural size.

with the exception of a few dark line-like markings when closed, are transparent. It is a very active insect, and has a habit of dropping or flying to the ground when plants, fruits, &c., on which it is resting are touched. The bug is furnished with a rostrum or beak, with which it sucks the sap from the plants, and causes them to wither and die. In the summer it is seen actually in thousands on potato and other crops, garden plants, &c., thereby causing growers considerable loss.



The "Fleming" Automatic Potato Sprayer.



Improved Automatic "Doncaster" Sprayer.

Plate VII.—Type of Spray Pumps in general use for spraying potato crops.

Some years ago, the first specimens of this insect were sent in from Rutherglen, hence the name Rutherglen bug. At that time, the insects were doing much damage to vegetables, tomatoes, potatoes, and to all kinds of fruit. Various experiments were carried out by Mr. C. French, senior, for the suppression of the pest, and good results were obtained by using the Benzole emulsion spray. At that time no motor spray pumps were available, and spraying the potato crops with hand pumps was a tedious proceeding.

PREVENTION AND REMEDIES.

See treatment recommended for thrips.

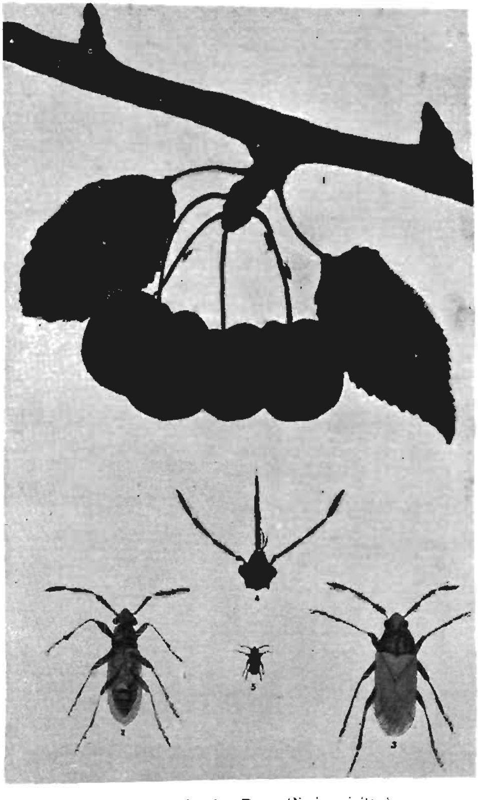


Plate VIII.—Rutherglen Bug. (*Nysius vinitor.*)

EXPLANATION OF PLATE.

Fig.
I. Branch of cherry tree, with fruit and insects. *Natural size.*
II. Perfect insect. Under view. Magnified.

Fig.
III. Perfect Insect. Upper view. Magnified
IV. Head of adult insect. Magnified.
V. Perfect insect. Natural size.

WIRE WORMS.

There are a considerable number of species of wire worms found in Victoria. They belong to the family of *Elateridæ*. The mature insects are known as Skip Jack, Click, or Flip Beetles, from their peculiar habit of springing into the air with a click, should they fall on their back.

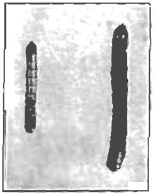


Plate IX.—Wire Worms.
(Natural Size.)

The wire worm, which is of a dark-brown shining colour, varies from ¼ to nearly 1 inch in length, being usually about as thick as a match. The body is cylindrical, rather flat, compressed at the head and pointed behind; each of the first, second, and third segments of the thorax carries a pair of short legs. Wire worms have powerful mandibles or jaws, which are well adapted for biting roots. The insects vary in length from ½ to 1¼ inches, the colour being generally dark brown or approaching light black.

Fortunately for growers in Victoria this pest does not appear to make much headway, no doubt owing to its natural enemies. A bad outbreak occurred some years ago in the Ballarat district, and caused growers much concern, but the trouble has not recurred. The accompanying photographs show how the larvæ of these beetles destroy the potatoes.

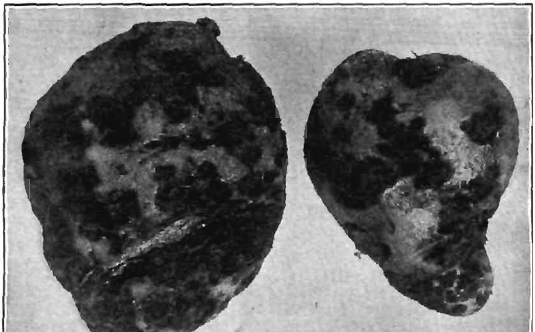


Plate X.—Potatoes damaged by Wire Worms.

Prevention and Remedies.

One of the best methods of keeping wire worms under control is to cultivate the ground frequently and thoroughly, turning it over and exposing the insects so that insectivorous birds can clear them off.

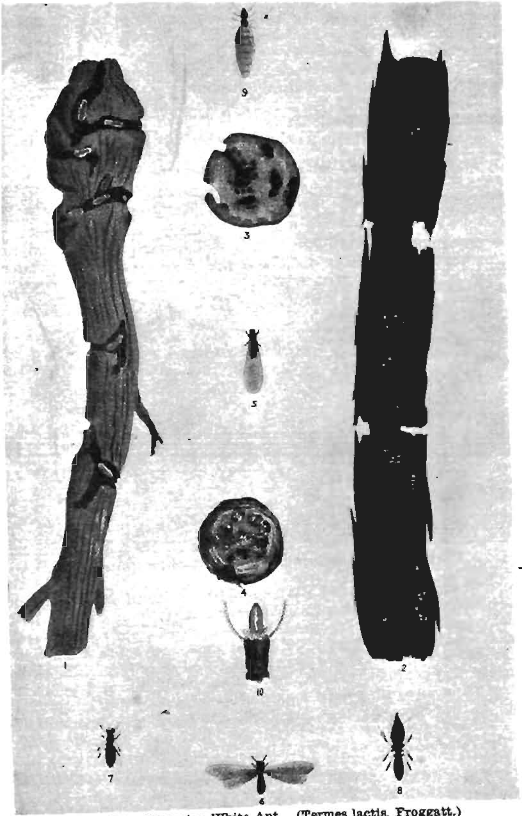


Plate XI.—Victorian White Ant. (Termes lactis, Froggatt.)

EXPLANATION OF PLATE.

Fig.
I. Portion of orange root attacked by white ants, showing insects at work and damage done. Natural size.
II. Portion of vine stem attacked by white ants, showing insects at work and damage done. Natural size.
III. Transverse section of orange root destroyed by white ants. Natural size.

Fig.
IV. Transverse section of vine root showing damage done by white ants. Natural size.
V. Male, with wings folded. Natural size.
VI. Male, with wings extended. Natural size.
VII. Worker. Natural size.
VIII. Soldier. Natural size.
IX. Queen. Natural size.
X. Head of "Soldier White Ant," showing the powerful jaws. Magnified.

Frequent harrowing will also keep them down, as by this means the wire worms are injured, and never reach the beetle stage. Poisoned baits are sometimes used with good results. These are made by cutting a few turnips, carrots, or potatoes into small pieces, soaking them in arsenate of lead, and then putting them into the soil.

Vaporite is a useful remedy. (For treatment and quantity to use, see under Victorian White Ant.)

Manurial Insecticide worked into the soil has given good results.

THE VICTORIAN WHITE ANT.

(*Termes lactis*, Froggatt.)

The so-called White Ant, which has no affinity to the true ant, is exceptionally common in many parts of this State, and its depredations are unfortunately well known. It is a destroyer of timber and furniture, as well as apricot, plum, and other fruit trees, vines, potatoes,

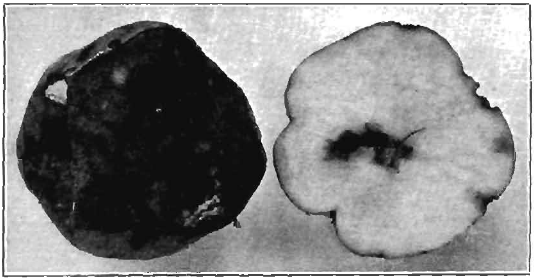


Plate XII.—Potatoes showing damage caused by White Ants.

&c. When a fruit tree is badly attacked by white ants the bark tends to change colour, and assume a sickly appearance.

Fortunately for potato growers this pest does not seem to make much headway, but at the same time it should be watched, for when once our native insects leave their natural food there is no telling what damage they may do. The white ants are small and of a yellowish-white colour, and in general appearance, not unlike tree ants. They inhabit structures known as termitaria, which are mounds or hillocks, in old roots of eucalypts and other trees. The plate gives a good idea of the various phases of the white ant and its workings.

Prevention and Remedies.

When it is intended to form a potato field, the first thing to be done is to have all old stumps and roots of trees removed and burnt. I have seen in many fields numbers of old stumps and roots of trees left, and on examination found them to be full of white ants in all stages. Where they are allowed to harbour they are liable to attack potatoes, so the necessity of destroying their breeding places is obvious. A careful grower has very little to fear from the attacks of white ants if this precaution is taken.

When taking out old stumps many white ants are likely to fall into the holes caused by their removal, and in such cases it is advisable to pour a cupful of bisulphide of carbon into each hole; cover it immediately, and stamp the soil well down. The fumes of the poison will destroy the ants. When using this chemical great care must be taken that no lights are placed near it as it is highly inflammable.

Another plan is to dig Vaporite into the soil, which is then pressed firmly down. The quantity to be used varies with the character of the soil: light soils require a lesser amount than heavy ones. The lighter the soil the more easily is the mixing effected, and the more easily will the gas penetrate. The quantity of Vaporite used is generally at the rate of 225 lbs. per acre for light soils, and about 350 lbs. for heavy soils, but for filling holes these quantities would be exceeded.

Manurial Insecticide worked into the soil has given good results.

MILLEPEDES.

Millepedes are closely allied to insects, but belong to another class (*Myriapoda*, which includes centipedes). The body is crustaceous, the

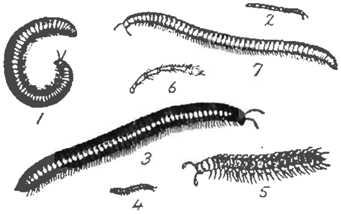


Plate XIII.—Millepedes.

EXPLANATION OF PLATE.

Fig.
1. Millepede. Magnified.
2. Natural size of No. 7.
3. Millepede. Magnified.
4. Natural size of No. 5.

Fig.
5. Millepede. Magnified.
6. Antenna or horn of Millepede. Magnified.
7. Millepede. Magnified (after Ormerod).

antennæ or feelers seven-jointed, and the first segment of the body has the form of a little shield The feet are numerous.

The eggs are laid in the ground amongst vegetation, &c. The young *Julidæ* (Millepedes) live two years before they are perfect, during which time they grow and change their skin five times. They maintain the same appearance throughout, excepting for an increase in the number of legs.

Millepedes are both herbivorous and carnivorous in their habits. At times they attack young potato plants when just sprouting under the soil, and on that account are mentioned here. In some localities in this State they do a certain amount of damage to other crops as well as potatoes.

Manurial Insecticide worked into the soil has given good results.

Prevention and Remedies.

One of the best remedies is to thoroughly cultivate the land. Remove and destroy all rubbish under which they could shelter. When they are in the ground Vaporite has given good results. The Vaporite should be well incorporated with the soil to a sufficient depth when the ground is cultivated. (See further particulars as to quantity to use under Victorian White Ant.)

Mr. W. E. Collinge, M.Sc., Birmingham, in his *First Report on Economic Biology*, states that the following remedy has proved very successful. In flower beds, dig out a hole sufficiently large to contain the fist and wrist; fill with bran, and cover with water. After two or three days pour on to the bran boiling water. The contents of two such holes were examined after treatment, and were found to contain 2,448 and 1,793 dead millepedes respectively.

WOOD LICE, SLATERS, OR SOW BUGS.

This pest is destructive to potatoes, both in the field and when stored in pits. Wood lice are not, strictly speaking, insects, but as they cause considerable damage they are included in this article on potato insect pests.

Wood Lice belong to the *Crustaceae*, a prime division of *Arthropods*, which includes lobsters, crabs, shrimps, prawns, &c. The common wood louse is mostly nocturnal in its habits, retiring during the day under stones, *debris*, old bags, bark, and, in fact, almost any kind of hiding place that is accessible, and coming forth in the evening to feed. It has a peculiar habit of contracting itself into a ball when disturbed. The eggs are very small, shining, and pale yelow-white in colour; they hatch rapidly under suitable conditions.

Prevention and Remedies.

Do not allow any *debris*, old bags, logs, &c., to lie about on fields where it is intended to plant potatoes, as the animals may lodge there.

Traps.—Cook in a solution of arsenic a piece of parsnip, beetroot, or potato, and place it in the haunts of the wood lice. They will eat this greedily.

Mr. A. M. Lea says—

> They can be trapped in large numbers by placing empty boxes (or bones on top of old sacks) at the side of the garden, and into these the wood lice will creep on the approach of day.

Should the wood lice be in the ground it would be advisable to treat the soil with Vaporite before sowing. Recent experiments conducted by the writer with this material proved very satisfactory. The Vaporite was well worked into the soil amongst the wood lice, and after a few days an examination of the ground showed the wood lice to be quite black, the gas from the Vaporite having destroyed them.

LAMINITIS OR FOUNDER.

By R. N. Johnstone, B.V.Sc.

[In an article which appeared in the *Journal of Agriculture, Victoria, for February,* 1913, "Wheat Gorge in Horses" was dealt with. As Laminitis often follows an overfeed of grain, this article is now published as a continuation.—Editor.]

Laminitis arises from a variety of causes, among them an overfeed of grain such as wheat, barley, maize, rye or new oats. New grains give rise to this trouble more frequently than grain which has been stored. Laminitis may also arise from overwork, or from standing for long periods—as on a ship voyage—and we get it as a sequel to difficult parturition, to pneumonia and other inflammatory diseases. The outer portion of the foot of the horse is composed of a horny box—the hoof. The inner surface of the hoof carries a number of leaf-like projections which project inwards and upwards, and are known as horny laminæ. Fitting into the projections between the horny laminæ are the sensitive laminæ, which serve to join the hoof to the bony portion of the foot and to carry the weight of the body. These laminæ, which are longer and stronger in front, carry blood vessels and nerves, and are very sensitive, corresponding somewhat to the quick of the human nail. Laminitis is an inflammation of the sensitive laminæ, and the consequent swelling causes pressure and pain.

The first symptoms of laminitis are those of fever, the temperature goes up several degrees, breathing is short and hurried, the mucous membranes of the eyes and nostrils are red, the mouth is dry and hot, and the urine scanty. As yet the walk is sound; but while standing the horse will lift first one foot and then the other, replacing them on the ground almost immediately. This paddling movement is kept up almost continuously. Within a few hours the pain in the affected feet becomes greater, and it is with difficulty that the horse can be induced to move. When the animal is compelled to move, the feet are shuffled forward in a cautious manner, and the weight is thrown on the heels. The affected feet feel hot to the touch, percussion with a hammer gives rise to great pain; and any attempt made to lift a foot is useless, the pain being so great that the animal is unable to bear extra weight on the opposite foot. When all four feet are affected, the animal puts the fore feet out in front of him, and the hind feet are put underneath the body as far as possible, the object being to throw most of the weight on the heels, where the pain is not so great. When the front feet alone are affected, the animal stands in the position just described, and throws as much weight as he can on the hind feet. When the hind feet only are affected, the animal gets all four feet as close together under his body as he can, the weight as far as possible is thrown on the front feet, while the hind feet are carried forward and placed on the heels. As might be expected, the pain is not so great when the animal is lying down. Strange to say, however, in most cases the animal persists in standing, but once down it is difficult to persuade it to rise again. Mild cases of laminitis if carefully treated recover in three or four days, the

fever subsides, the appetite returns, and the walk becomes easier. Cases recovering so soon as this do not seriously alter the shape of the foot. When recovery is delayed longer than this, although the animal may become perfectly sound, the wall of the hoof will always show rings, and the sole will be slightly flattened. In more serious cases, the sensitive and horny laminæ separate—particularly at the toe—and the whole weight is thrown on the sole, causing dropped sole and permanent lameness. Occasionally the pedal or coffin bone penetrates the sole and comes in direct contact with the ground. If treatment should be commenced in the early stages, before acute lameness is shown, remove the shoes from the affected feet, cut or rasp the walls down until the foot is bare. The object in doing this is to bring the sole as near the ground as possible, so that when the animal is walking or standing the ground will support the sole, which will take more than its usual amount of weight and thus relieve the strain from the wall and the sensitive laminæ attached to it. When lameness is acute, it will be almost impossible to do this while the horse is standing, owing to the animal being unwilling or unable to stand on three feet. The sole should not be pared or thinned in any way; it requires all its strength to carry the extra weight which will be thrown on it. Bleeding from the toe or coronet should not be allowed, because wounds in these localities are extremely difficult to keep clean, and so are liable to become septic and cause serious complications; and the amount of horn cut away when bleeding at the toe is attempted weakens the sole more than is advisable. Bleeding from the jugular vein is allowable, but never more than a gallon of blood should be removed. Cold water should be applied to the feet. When a suitable water course, pond, or other expanse of shallow water is at hand, the animal should be kept standing in it; or, if possible, walked about in it. When suitable apparatus is available, a constant stream of cold water over each foot from a rubber hose is beneficial. If lameness is not severe, the animal should have walking exercise from half-an-hour to an hour and a half three times a day on soft ground. While it may be difficult to get the animal to move at the start, the action will improve with exercise. Between times a cold foot bath should be given.

In the early stages of the trouble, while fever is a prominent symptom, give Tincture of Aconite, ½ drachm, three times daily. Many animals will take this in their drinking water. Nitrate of Potash, ½ drachm, and Epsom Salts, 2 ounces, may also be given in the drinking water. Complications to be looked for are pneumonia and suppuration in the affected feet. In the latter case, the pus which develops in the foot should be liberated. The necessary operation and subsequent treatment should be carried out by an experienced veterinarian.

Good nursing is very necessary in these cases. During the first stages of the disease, a light and easily digested diet should be allowed—bran mashes, roots and green food when available—the water supply should be ample, the body should be warmly clothed, and if treated in a box the animal should get plenty of fresh air. A good supply of bedding should be given, but long straw should be avoided, as it rolls up in front of the animal and prevents free movement. Chaff, tan or sand is much more satisfactory in these cases.

THE FRUIT TRADE OF VICTORIA.

ITS PRESENT STATUS FROM A COMMERCIAL STAND-POINT.

PART X.—PACKING—*continued.*

(*Continued from page 705.*)

By E. Meeking, Senior Fruit Inspector.

A Plea for the Introduction of the Diagonal-numerical System of Packing Apples—*continued.*

Packing in the Australian Case.

The Australian export so-called "dump" case may be utilized for diagonal numerical packing of apples, and the list of packs shown hereunder have been worked out by Mr. C. D. Samson, who has kindly submitted them to the officers of the Department. They have been tested and found quite applicable. The Australian case is suitable for packing the larger sized apples. Concerning the smaller sized apples, the American case is much better suited for packing these than the Australian case, and in most other respects it lends itself for general purposes of packing to greater advantage than the Australian case, as will be shown hereunder in the summarized comparison of the two cases.

Schedule of Different "Packs" Adopted for Packing Apples in the Australian Export Case under the Numerical System.

Approx. Diameter of Apple.		Apples to Case.	
2 × 1 "Packs" 2½ tier .. .. 5 tiers to case.			
3⅞ inches ..	3 × 3 = 2 rows of 3 + 1 row of 3 = 6 + 3 = 9 × 5 =	45	
3¾ ,, .	4 × 3 = 2 .. 4 + 1 .. 3 = 8 + 3 = 11 × 5 =	53	(*)
3⅝ ,, .	4 × 4 = 2 .. 4 + 1 .. 4 = 8 + 4 = 12 × 5 =	60	
3½ ,, ..	5 × 4 = 2 .. 5 + 1 .. 4 = 10 + 4 = 14 × 5 =	68	(*)
3⅜ ,, ..	5 × 5 = 2 .. 5 + 1 .. 5 = 10 + 5 = 15 × 5 =	75	
3⅜ ,, ..	6 × 5 = 2 .. 6 + 1 .. 5 = 12 + 5 = 17 × 5 =	83	(*)
3¼ ,, ..	6 × 6 = 2 .. 6 + 1 . 6 = 12 + 6 = 18 × 5 =	90	
3⅛ ,, ..	7 × 6 = 2 .. 7 + 1 .. 6 = 14 + 6 = 20 × 5 =	98	(*)
3 ,, ..	7 × 7 = 2 .. 7 + 1 .. 7 = 14 + 7 = 21 × 5 =	105	
2 × 2 "Packs," 3½ tier .. .. 6 tiers to case.			
3⅛ inches .	4 × 7 = 2 rows of 4 + 2 rows of 4 = 8 + 8 = 16 × 6 =	96	
3 ,, ..	5 × 4 = 2 .. 5 + 2 .. 4 = 10 + 8 = 18 × 6 =	108	
2⅞ ,, ..	5 × 5 = 2 .. 5 + 2 .. 5 = 10 + 10 = 20 × 6 =	120	
2¾ ,, .	6 × 5 = 2 .. 6 + 2 .. 5 = 12 + 10 = 27 × 6 =	132	
2⅝ ,, ..	6 × 6 = 2 .. 6 + 2 .. 6 = 12 + 12 = 24 × 6 =	144	
2½ ,, .	7 × 6 = 2 .. 7 + 2 .. 6 = 14 + 12 = 26 × 6 =	156	
2¼ ,, ..	7 × 7 = 2 .. 7 + 2 .. 7 = 14 + 14 = 28 × 6 =	168	
2⅛ ,, ..	8 × 7 = 2 .. 8 + 2 .. 7 = 16 + 14 = 30 × 6 =	180	
3 × 2 "Packs," 4½ tier .. .. 7 tiers to case.			
2⅝ inches ..	5 × 5 = 2 rows of 5 + 2 rows of 5 = 15 + 10 = 25 × 7 =	175	
2½ ,, ..	6 × 5 = 3 .. 6 + 2 .. 5 = 18 + 10 = 28 × 7 =	193	(*)
2⅜ ,, ..	6 × 6 = 3 .. 6 + 2 .. 6 = 18 + 12 = 30 × 7 =	210	
2¼ ,, ..	7 × 6 = 3 .. 7 + 2 .. 6 = 21 + 12 = 33 × 7 =	228	(*)
2⅛ ,, ..	7 × 7 = 3 .. 7 + 2 .. 7 = 21 + 14 = 35 × 7 =	245	
2 ,, ..	8 × 7 = 3 .. 8 + 2 .. 7 = 24 + 14 = 38 × 7 =	263	
2 ,,	8 × 8 = 3 .. 8 + 2 .. 8 = 24 + 16 = 40 × 7 =	280	

Note.—The "packs" marked thus (*) are packs containing tiers with alternating numbers, the same as those shown in the schedule of packs for the Canadian case. *The principle of the method applied to* these is the same as that which applies to the alternating pack in the Canadian cases, with the exception *of course, that more tiers in apples* of the same diameter go to the Australian case than can be packed in the Canadian case. Plate VI. will serve to illustrate the principle.

RELATIVE MERITS OF THE CANADIAN AND AUSTRALIAN CASE COMPARED.

Many of our exporters who have seen the Canadian case raise the objection that, owing to the non-rigidity of the tops and bottoms, more bruising would be likely to take place in the handling during transportation than would occur to fruits packed in the Australian case. A little thought will show, however, that such a contingency is more apparent than real, as the rigidity of the outer covering does not save the contained fruit if dropped or thrown down violently; in fact, the rigidity of the cases is, under such circumstances, a drawback. A tightly packed case of fruit put up in a non-rigid box permits no "give" in any part of such package when subjected to jolts, excepting the cells of the fruits, which, taking the packages as

Fig. (a). Fig. (b).

PLATE VI.

2 × 1 pack, 2½ tiers, 6–5 rows = 17 and 16 rows to alternate tiers, 5 tiers to case = 83 apples.
(a) 2nd and 4th tiers, 16 apples to tier; (b) 1st, 3rd, and 5th tiers, 17 apples to tier.

a whole, are the only portion of such package of a fragile character. Briefly, this is an exemplification of the old adage concerning the chain and its weakest link, and the weakest link in a packed case of fruit is the cells of the fruit. The ideal to be aimed at, therefore, is to provide a package which will allow any sudden pressure brought to bear upon these cells to be transferred to the outer package itself in order to minimize the strain upon the cells. The Canadian case seems to "fill the bill" better than the Australian case, as the fruits, when under rough handling, would not meet with direct resistance either from each other or from the sides of the case itself, and therefore would receive, on this account, a minimum of bruising. For

example, if a severe blow or pressure be given to the top of the Canadian case, a corresponding amount of "give" takes place in the bottom of the case, and thus the effect of the pressure on the top is greatly minimized. At any rate, our aim should not be to try and make a case to suit our handling, but should be to try and make our handling suit our case. It is the practice in Canada and the United States of America to line the cases with lining paper cut to the following dimensions:—19¾ inches wide by 26 inches long. Two sheets are used to line the case, the first sheet being placed in the case in such a way as to cover slightly more than half of the bottom and all of one side. The second sheet is similarly placed on the other side of the case. When the case is packed, the paper is folded over so

Fig. (*a*). Fig. (*b*).

PLATE VII.

(*a*) 2 × 2 packs, 3½ tier
7–6 rows, 6 tiers
to case = 156 apples.

(*b*) 3 × 2 pack, 3½ tier
6–6 rows, 7 tiers
to case = 210 apples.

as to completely cover the top of the fruit. In some respects this lining of the case may be considered a disadvantage through preventing free air circulation. It has the advantage, however, of keeping the wrappers of top tier of fruit clean and dry, and adds to the attractiveness of the package when opened.

In many respects, other than those mentioned above, our present case falls short of requirements. The hardwood of which it is composed does not lend itself to cutting to sizes of uniform thickness, and makes it very difficult to standardize the thickness of the tops, bottoms, ends, and sides. It thus renders the matter of obtaining a uniform outside measurement very difficult, and operates against fixing a

standard quantity of cases which should go to the ton for shipping purposes. The case is also far from being an ideal one in the way of attractiveness, and does not lend itself to effective marking from an advertising point of view. This is a matter which our growers should consider, as it would appear that, so far, they have not realized the utility of the "gentle art of advertising" to anything like the extent that the growers in North America have done. Plate VIII. shows a cheap, efficient, and attractive label reproduced from a case of apples exported to this State from the Wenatchee Fruit-growers' Association, Washington, U.S.A. A plea that is often put forward in support of the use of Australian hardwoods in the manufacture of our fruit cases is that such action encourages the development of a

Plate VIII.

Label on American case of apples

local industry. It should be remembered, however, that the manufacture of fruit cases from our hardwoods is, from an economic point of view, putting this timber to a use for which it is not best suited, as it may, and should, be put to more valuable use, such as in the manufacture of furniture, office fittings, &c. The only serious objection to the Canadian case is that, by reason of the bulge in the tops and bottoms, some waste space is caused in stowage. This drawback, however, is more apparent than real, as when the Canadian cases are used no laths require to be placed between the tiers to permit of the circulation of the cold air in the ship's refrigerator.

(*To be Continued.*)

DAIRY RECORDS.

J. A. Ruddick, Dairy and Cold Storage Commissioner, Ottawa, Canada, writes:—

"Unless the figures are actually before one, the variations in production found in the same herd seem almost incredible. For instance, in three Ontario herds, the difference in yield between the best and the poorest cow runs actually at 8,100, 9,100 and 10,900 lbs. of milk: the extremes in individual cows are 3,690 and 17,615 lbs. This proves that neither an occasional weighing or testing of a sample, nor a hasty reckoning of a herd's average yield can possibly give any measure of justice either to the abundant or to the economical producer, so that the knowledge requisite to building up a good herd has still to be sought. That knowledge can be found in dairy records."—(Circular D. and C. S. No. 7.)

An increase of 600 lbs. of milk per annum or 2 lbs. a day over a milking period of 300 days from each of the cows in this State would yield over another half million pounds sterling to our yearly revenue from dairying.

THE MILLING AND BAKING QUALITIES OF VICTORIAN WHEATS.

(Continued from page 639.)

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent; P. R. Scott, Chemist for Agriculture; and F. G. B. Winslow, Departmental Miller.

PART III.

In previous articles consideration was given both to the qualities which made a wheat valuable for milling and baking purposes and also to the methods in vogue for determining these qualities.

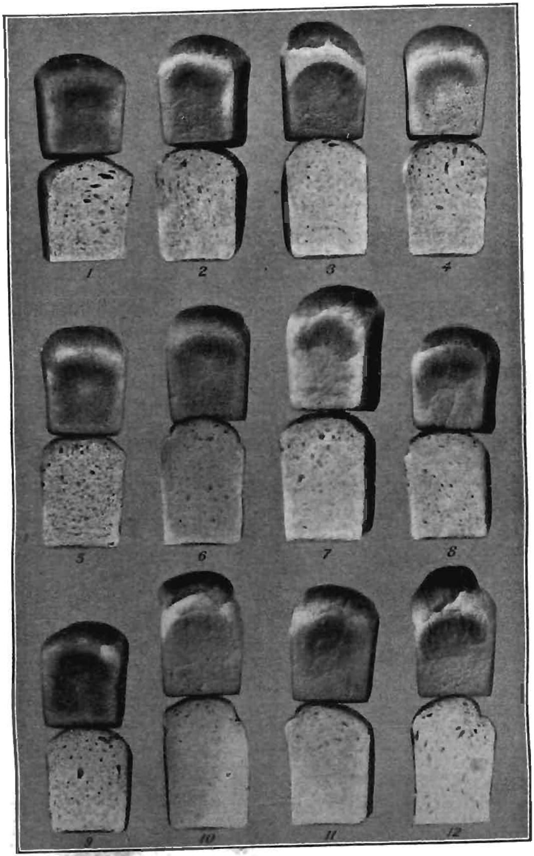
We may now consider the differences in the milling and baking qualities of some typical Australian varieties of wheat. For this purpose the results of milling and baking tests made on a number of varieties of wheat grown at the Rutherglen Experiment Farm and the Longerenong Agricultural College, during the season 1912-13, may be considered. In the process of milling the grain and baking the flour of these varieties practical information regarding the amount of water required for conditioning the grain, the percentage of mill products, percentage of break flour, colour of the flour, weight and volume of a standard loaf, and the general behaviour of the varieties in the mill and in the bakehouse may be obtained. Such information, when expressed in quantitative terms, enables those familiar with the industry to form an idea of the relative values of the different varieties.

During the last season twenty-one varieties of wheat were grown at the Rutherglen Experiment Farm, and eleven varieties at Longerenong. Representative samples of each variety were submitted to a milling and baking test with the object of acquiring the information outlined above. Several of the wheats grown at the Rutherglen

Table I.—Results of Milling and Baking Tests with Wheats from Rutherglen Experiment Farm.

Name.	Weight per Bushel.	Break Flour.	Water absorbed in conditioning.	Percentage of Mill Products. Flour.	Bran.	Pollard.	Colour of Flour.	Weight of Standard Loaf (24 hours after baking).	Texture. Max., 20 points.	Colour. Max., 20 points.	Volume of Standard Loaf.	Water absorbed in doughing.	Remarks.
	lbs.	%	%	%	%	%		Grams			c.cm.	c.cm	
American 8 ..	66·0	8·8	3·5	70·8	17·1	12·1	Fair	473	14	16	1,310	192	Bran: thick, broad, easy to mill. Grain: small, hard, red, shotty. Dough rose well in oven: loaf: *good colour crust.*
Bayah ..	65·1	10·0	3·5	72·0	15·8	12·2	Good	465	12	12	1,375	188	Bran: broad, easy to mill. Grain: large, plump. *Dough rose well* in oven; loaf: dull colour crust.
Bunyip ..	63·0	9·5	3·5	71·9	16·0	12·1	..	480	20	20	1,430	200	Bran: thick, *broad.* Grain: large, poor appearance. Dough rose well in oven; loaf: good appearance and colour *crust.*
Cedar ..	56·0	6·5	7·0	71·8	17·5	10·7	Fair	470	16	12	1,430	244	Bran: small. Flours granular. Grain: small, hard, shotty. Dough: very *little rise in oven.*
Comeback ..	65·0	10·0	4·0	73·0	14·5	12·5	,,	465	18	12	1,410	220	Bran: small, easy to mill. Grain: small, shotty. Dough hard to knead, slow proving; crust fair.
Dart's Imperial	66·5	12·4	3·0	72·8	16·9	10·3	Very good	465	14	14	1,440	185	Bran: thin. Flour: nice bloom, easy to mill. Grain: good appearance. Dough rose well in *oven; good* colour crust.
Federation ..	63·0	9·5	3·5	71·1	16·8	12·1	Fair	465	12	16	1,440	185	Bran: thick, easy to mill. Grain: large. Dough: very *little rise in oven;* medium colour crust.
Firbank ..	64·5	11·2	3·5	72·2	17·0	10·8	Very fair	467	16	14	1,540	187	Bran: broad, thick. Flour: nice bloom. Dough rose well in oven; *excellent crust and loaf.*
Genoa ..	64·0	8·7	3·5	75·7	14·9	9·4	Very good	467	16	14	1,620	191	Bran: broad, thick. Grain: large, sprouted. Dough rose well in oven; good *colour crust.*
Gluyas ..	64·0	8·5	3·5	71·6	17·0	11·4	..	466	20	12	1,375	188	Bran: broad, thick, easy to mill. Grain: dull, plump. Dough: very little rise in oven.
Huguenot ..	66·0	1·4	9·0	71·2	17·2	11·6	Dark	479	12	8	1,310	212	Bran: thin. Flour: ricey. Grain: long, angular, translucent. Dough: hard to knead, slow *working.*
King's Early	64·8	11·5	3·5	68·7	17·9	13·4	Very fair	466	16	16	1,500	178	Bran: thick. Grain: large, poor appearance. Dough rose *well in oven;* excellent crust.

Kubanka ..	65·5	3·0	9·0	72·7	15·4	11·9	Dark	478	18	16	1,480	212	Bran: thin. Flour: granular, ricey. Grain: hard and translucent. Dough rose well in oven; crust very yellow.
Medeah ..	65·0	5·1	7·5	73·3	15·5	11·2	,,	474	12	8	1,210	192	Bran: *small, thin,* difficult to mill. Grain: large, long, translucent. Dough very hard to knead; slow working into dough.
Marshall's ..	63·0	10·0	4·0	72·2	14·9	12·9	Very good	473	12	16	1,400	176	Bran: broad, thin. Flour: excellent bloom. Grain: *large, plump.* Dough rose well *in* oven; excellent colour crust.
Thew ..	64·5	9·5	4·5	72·8	16·7	10·5	Dark	467	20	20	1,710	199	Bran: thin, clean. Flour: ricey, granular. Grain: small, hard, semi-translucent. Dough rose very high *in oven; excellent* colour crust and loaf.
Triumph ..	64·5	11·0	3·5	70·9	15·2	14·9	Poor	471	16	20	1,380	180	Bran: broad, thick, easy to mill. Grain *sprouted.* Dough: *medium rise;* excellent colour crust and general appearance.
Turkey Red	64·5	12·0	7·5	71·5	17·1	11·4	Very fair	470	20	20	1,525	182	Bran: *thin. Flour: granular. Grain:* small and shotty. Dough rose high in oven; easy *to* work; *crust* and loaf good appearance.
White Tuscan	65·0	12·2	3·5	72·7	15·4	11·9	Very good	461	16	14	1,400	189	Bran: broad, thin, easy to mill. Grain: large. *Dough rose well;* loaf and crust good appearance.
Yandilla King	63·1	7·8	3·0	73·5	14·5	12·0	Good	465	8	8	1,170	190	Bran: *thick, easy* to mill. Grain: large, plump, sprouted. Dough easy to work: rose well, *but fell back in oven.*
Zealand Blue	65·0	7·6	3·5	72·0	15·5	12·5	Very good	467	20	20	1,440	189	Bran: broad. Flour: good bloom, easy to *mill.* Grain: *medium* size, plump. Dough rose well in oven; crust excellent colour.
Victorian Standard f.a.q. sample, 1912–13	63·0	8·2	3·0	70·9	18·9	10·2	Good	466	16	16	1,545	187	Bran: *broad.* Flour: nice bloom, appearance lively. Grain mixed.

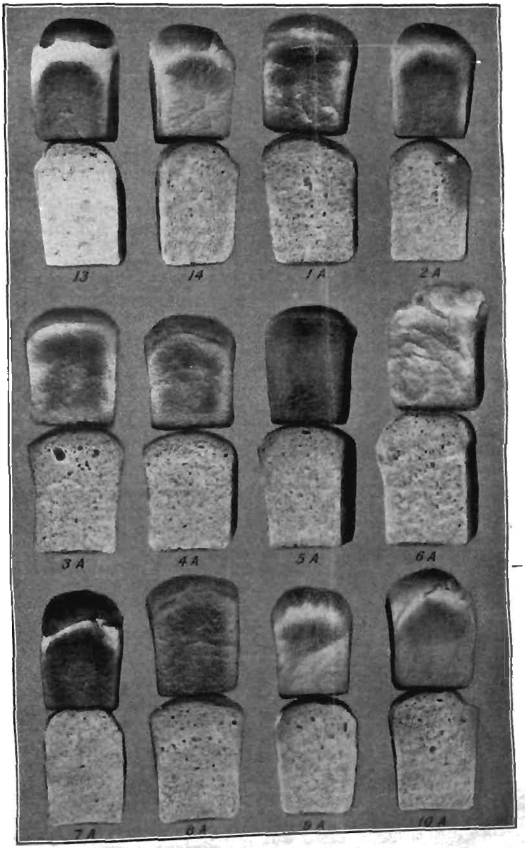


Loaves baked from Rutherglen Wheats.

No. 1. American 8.
„ 2. Bayah.
„ 3. Bunyip.
„ 4. Comeback.

No. 5. Federation.
„ 6. Firbank.
„ 7. Genoa.
„ 8. Gluyas.

No. 9. Huguenot.
„ 10. King's Early.
„ 11. Kubanka.
„ 12. Thew.



Loaves baked from Lengerenong Wheats.

No. 13. Turkey Red (Rutherglen).
,, 14. White Tuscan (Rutherglen)
,, 1A Bayah.
,, 2A. Dart's Imperial.

No. 3A. Federation.
,, 4A. Gluyas
,, 5A. Huguenot.
,, 6A. King's Early.

No. 7A. Kubanka.
,, 8A. Marshall's No 3.
,, 9A. Zealand Blue.
,, 10A. Victoria F.A Q.

Experiment Farm were found to be slightly sprouted as a result of the heavy rainfall during the latter part of November, 1912. Table I. summarizes the results of the milling and baking tests obtained with the Rutherglen wheats.

The percentage of straight grade flour produced from the samples, and this in a large measure determines the value of the grain, varied from 68.7 per cent. in the case of King's Early to 73.5 per cent. with Yandilla King. The break flour varied from 1.4 per cent. with Huguenot to over 12 per cent. with White Tuscan and Dart's Imperial. Break flour, as a rule, has a determining effect in the colour of the flour, the more break flour the poorer the colour.

Similar variations were noted with respect to the amount of water required to bring the grain into condition for milling. The maximum —9 per cent. was required for the flinty durum varieties—Kubanka and Huguenot—while the minimum, 3 per cent., was required by soft varieties like Dart's Imperial and Yandilla King.

As a considerable percentage of the moisture absorbed in the process of conditioning is ultimately retained in the mill products, the amount absorbed by the respective varieties is of some importance to the miller. Generally speaking, the moisture content of Australian wheat is low, more especially in the harvest months and in districts where Summer temperatures are high and the atmosphere extremely dry. During storage in a grain shed or in the process of transportation to Europe, a considerable amount of water is absorbed, and the amount so gained is a direct gain to the wheat exporter. The amount gained during storage or transportation to England largely depends, of course, on the locality in which the wheat is grown. From evidence submitted to the South Australian Royal Commission on the marketing of wheat, it would appear that the increase of weight accruing from storage for a period of six months amounted to from 0.75 to 3.5 per cent. of the total weight of wheat.

With respect to the quantity of bread and the volume of the loaf produced from these varieties, considerable differences were noted. In these tests each flour was treated and baked under similar conditions. (The mode of proving the dough, the temperature of the oven, and the time of baking were kept constant for each variety.) It is questionable whether the best results are obtained from high strength flours by baking them under the same conditions as low strength flours, which form the bulk of the types grown. The method followed does, however, do full justice to the low strength varieties. It will be noted that the yield of bread varied from 461 to 480 grams per standard loaf, and the volume from 1310 c.cm. to 1710 c.cm. What is more important still, the texture and quality of the loaves varied very considerably in the different varieties. An attempt has been made to convey the differences between the loaves of representative varieties by means of photographs.

Besides the orthodox milling tests, it is desirable to obtain information regarding the protein and gluten content of the different varieties, for the nutritive value of the flour depends largely on the ratio of the protein to the carbohydrates.

Table II. supplies information regarding the protein content of the grain and flour, the dry gluten, and the strength of each variety.

TABLE II.—PROTEIN AND GLUTEN CONTENT AND STRENGTH OF VARIETIES GROWN AT RUTHERGLEN, 1912–13.

Name of Variety.	Protein Content of Wheat.	Protein Content of Flour.	Gluten Content of Flour.		Ratio of Wet and Dry Gluten.	Strength of Flour.
			Wet.	Dry.		
	%	%	%	%		(Quarts per 200-lb. sack.)
American 8	12·50	11·56	29·9	9·60	3·02	45·2
Bayah	12·44	11·37	28·4	9·19	2·90	44·2
Bunyip	13·55	11·99	28·0	9·53	3·11	47·2
Cedar	13·18	11·62	24·63	8·67	3·13	57·2
Comeback . .	13·06	11·44	25·27	8·90	3·10	51·6
Dart's	10·62	10·12	27·40	8·73	2·84	43·6
Federation . ..	11·62	10·06	28·2	9·12	3·09	44·6
Firbank	11·12	10·31	24·22	8·32	2·91	44·0
Genoa	12·06	11·37	32·60	10·39	3·03	43·0
Gluyas	11·37	10·99	25·60	8·08	3·19	43·0
Huguenot	12·24	11·44	32·37	11·20	2·90	50·0
King's Early	14·00	12·06	23·40	9·83	3·13	42·0
Kubanka	10·99	9·43	27·45	9·25	2·93	50·0
Marshall's .. .	10·31	9·68	25·87	8·11	3·20	42·4
Thew	14·68	13·31	33·8	10·44	2·86	46·4
Triumph	11·12	10·31	26·4	8·25	2·91	42·4
Turkey Red . ..	12·24	11·31	29·44	9·73	3·39	45·2
White Tuscan	11·87	10·37	26·75	8·52	2·84	44·4
Yandilla King	10·99	9·49	27·62	8·91	3·09	44·4
Zealand Blue	10·93	9·87	22·90	7·79	3·16	44·6
The Standard Victorian f.a.q. Sample Season 1912-13	11·68	11·06	25·97	7·81	3·31	44·8

The protein content was determined by estimating the nitrogen content of the wheat and flour by the well-known *Kjeldahl* process and multiplying the result by 6.25. This factor is used on the assumption that the average nitrogen content of the proteins of the wheat kernel is 16.25 per cent. The amount of wet and dry gluten, and the strength, were estimated as described in previous articles.

It will be noted that the protein content of the wheat varies from 10.31 per cent. with Marshall's No. 3 to 14.68 per cent. with Thew. The standard F.A.Q. sample for the same harvest contains 11.68 per cent. of protein. A similar range is noted in the case of the protein content of the flour, the extremes in this case being 9.43 per cent. with Kubanka and 13.31 per cent. with Thew. The most important of the proteins in the flour are gliadin and glutenin, which together make up the gluten of the flour.*

The figures for dry gluten range from 7.79 per cent. to 10.44 per cent. The gluten content of the standard sample was 7.81 per cent.

The variations in strength or water absorption capacity of the flour range from 42.0 in the case of King's Early to 57.2 per cent. in the case of Cedar.

* *Vide* page 527, *Journal of Agriculture*, September, 1913.

TABLE III.—RESULTS OF MILLING AND BAKING TESTS WITH WHEATS FROM LONGERENONG AGRICULTURAL COLLEGE.

Name.	Weight per Bushel.	Break Flour	Water absorbed in conditioning.	Percentage of Mill Products. Flour.	Percentage of Mill Products. Bran.	Percentage of Mill Products. Pollard.	Colour of Flour.	Weight of Standard Loaf (24 hours after baking).	Texture. Max., 20 points	Colour. Max., 20 points.	Volume of Standard Loaf.	Water absorbed in doughing.	Remarks.
	lbs.	%	%	%	%	%		Grams			c.cm.		
American 8 ..	65·25	9·8	6·5	67·2	20·3	12·5	Good	465	20	20	1,330	187	Bran: choppy. Flour: granular, good bloom. *Grain: small, plump, red.* Dough rose well in *oven: excellent colour crust.*
Bayah ..	64·0	10·7	3·0	70·5	17·0	12·5	Very fair	457	12	12	1,370	183	Bran: thin. Flour: good bloom. *Grain: large,* plump, soft. Dough rose well in oven.
Dart's ..	64·0	8·0	3·0	70·3	18·0	11·7	Very good	462	12	12	1,450	189	Bran: thin. Flour: good bloom. Grain: small, plump, soft. *Dough rose* well in oven; good colour crust.
Federation ..	64·5	10·2	3·0	71·6	16·4	12·0	Good	471	12	14	1,490	201	Bran: broad. Grain: medium size, fairly soft, good colour. Dough rose well in oven: colour of crust dull.
Gluyas ..	63·0	12·5	3·0	72·4	15·2	12·4	Very good	480	20	20	1,330	183	Bran: thin, clean. Grain: large, plump, colour good, *soft. Dough rose well* in oven; excellent colour crust.
Huguenot ..	62·0	1·5	10·0	71·2	18·2	10·6	Dark	460	12	8	1,720	216	Bran: thin, broad. Flour: yellow, ricey, granular. Grain: large, dark amber colour, flinty. Dough very hard to knead: slow in proving.
King's Early	64·2	11·9	3·0	69·8	19·1	11·1	Very good	461	20	16	1,480	178	Bran: broad, thin. *Grain: large, plump,* fairly hard, good colour. Dough rose well in oven: crust excellent colour.
Kubanka ..	65·0	2·6	8·0	72·3	16·0	11·7	Dark	465	18	14	1,480	184	Bran: broad, thin. Flour: ricey, granular. Grain: bright amber colour, large, long, and flinty. Dough rose well in oven.
Marshall's 3..	63·25	10·3	3·5	70·6	18·0	11·4	Good	468	12	14	1,275	191	Bran: broad. Flour: good bloom, granular. Grain: medium size, plump. Dough rose well *in oven:* excellent crust, and good loaf.
Turkey Red	64·75	12·4	6·5	72·4	16·2	11·4	Very fair	466	20	20	1,450	187	Bran: choppy. Flour: ricey, granular. Grain: small, plump, red colour, *and flinty. Dough* rose well in oven: excellent colour crust, and good loaf.
Zealand Blue	64·0	9·4	2·5	73·9	17·2	8·9	Excellent	467	16	16	1,520	197	Bran: *broad, thick.* Flour: good bloom. Grain: large, plump, good colour, soft. Dough rose well in oven: crust excellent colour.

It will be apparent from a study of the above table that the water absorption capacity of the flour does not depend on the amount of protein or dry gluten in the flour.

Turning now to the eleven varieties grown at Longerenong, similar variations in milling and baking quality of the different varieties may be observed.

Table III. gives a condensed summary of the results.

From the above table it will be seen that the amount of break flour produced varies from 1.5 per cent. in the case of Huguenot and similar varieties of the durum class to 12.5 per cent. in the case of soft weak flour varieties like King's Early.

The amount of water required for conditioning varies from 2.5 per cent. in the soft flour varieties to 10 per cent. in the case of the durum wheats.

In percentage of flour produced King's Early stands lowest with 69.8 per cent., whilst the highest yield, 73.9 per cent., was obtained from Zealand Blue.

The protein and gluten contents of the Longerenong varieties are considerably higher than similar varieties produced at Rutherglen. This is clearly brought out in Tables IV. and V.

TABLE IV.—PROTEIN AND GLUTEN CONTENT AND STRENGTH OF VARIETIES GROWN AT LONGERENONG.

Name of Variety.	Protein Content of Wheat.	Protein Content of Flour.	Gluten Content of Flour. Wet.	Gluten Content of Flour. Dry.	Ratio of Wet and Dry Gluten.	Strength of Flour.
	%	%	%	%		(Quarts per 200-lb. sack.)
American 8	12·56	12·30	33·10	10·67	3·10	44·0
Bayah	12·18	11·62	30·90	10·50	2·94	43·2
Dart's	12·94	10·93	34·43	10·38	3·31	44·6
Federation (Ordinary) ..	11·62	10·43	23·70	8·27	2·86	45·3
Gluyas	11·44	10·87	28·27	9·42	3·00	43·0
Huguenot	14·80	14·00	41·94	14·25	2·94	46·2
King's Early	13·81	12·62	34·70	11·09	3·12	42·0
Kubanka	12·50	11·18	32·25	11·53	2·74	43·4
Marshall's 3	11·56	9·81	26·38	8·90	2·96	44·2
Turkey Red	12·87	12·30	34·1	10·95	3·11	44·0
Zealand Blue	14·25	12·87	31·0	10·37	3·31	46·4

TABLE V.—AVERAGE PROTEIN AND GLUTEN CONTENT OF LONGERENONG WHEATS COMPARED WITH THE SAME VARIETIES FROM RUTHERGLEN.

—	Protein Content of Wheat.	Protein Content of Flour.	Dry Gluten	Strength of Flour
	%	%	%	(Quarts per sack.)
1. Average content of 11 varieties from Longerenong, 1912–13	13·78	11·72	10·58	44·2
2. Average content of the same 11 varieties from Rutherglen, 1912–13	11·64	10·72	9·08	44·9
3. Standard f.a.q. Sample, 1912–13 ..	11·68	11·06	7·81	44·8

It will be noted that the average protein content of the Longerenong varieties was considerably higher than that of precisely similar varieties from Rutherglen. This fact is more striking when one considers that the varieties at each centre came from the same stock the season before.

The composition of wheat raised on any given spot depends on three main factors—(1) the nature of the season, (2) the nature of the soil on which the seed is grown, and (3) the variety of wheat grown.

There have always been considerable differences of opinion as to how far the quality of the wheat is determined by its environment—*i.e., soil and climatic conditions, and how far it may be regarded as characteristic of the variety.*

The problem is one of considerable importance both to the wheat breeder and to the miller. A knowledge of the respective parts played by heredity and by environment in the production of quality in wheat is of importance to the wheat breeder whose ultimate objective is the combination into one breed of the valuable qualities possessed by several different varieties. Such knowledge is of value also to the miller, inasmuch as it will enable him to know in what localities and under *what conditions the production of high milling and baking quality in wheat becomes possible.*

As a result of much investigation and research, it is now generally admitted that the seasonal conditions during the period of growth have a marked influence on the composition and quality of the grain. Lawes and Gilbert* showed that the variations in composition due to season were greater than the variations due to differences in manuring. Later experience tends to confirm this view and to show that the soil has less influence on the quality of the product than the climate.

It has been fairly definitely shown that the more protracted the growing period, and especially the period between fertilisation and maturity of the seed, the less the percentage of protein and the greater the amount of starch in the product. On the other hand, a rapid ripening period is usually associated with high protein and gluten content of the grain, and a low percentage of starch.

The protein content is also associated with the amount of soil moisture in the last stages of ripening. Widstoe† demonstrated that wheat grown on a soil in which the moisture content rapidly diminished during the ripening process resulted in grain of high protein content. Wheat grown on irrigated land has invariably less protein than wheat grown on arid land in the same locality. So far as the influence of mineral plant foods is concerned, it is fairly certain that the application of phosphates leads to increased amounts of phosphorus and potash in the grain. On the other hand, such applications tend to lower the amount of protein and nitrogen in the grain. Moreover, the percentage of protein in the plant also varies with the supply of

* *Journal of Chemical Society*, London, 1884.
† Widstoe, Utah Experiment Station, *Bulletin No. 80 (1902).*

soil nitrogen. The more available nitrogen found in a soil, the higher the protein content of the kernel. It may be of interest here to note that throughout the growing season monthly determinations of the moisture and nitrate nitrogen content of the respective soils showed that the Longerenong soil contained uniformly higher percentages of nitrate nitrogen than the Rutherglen soils.

The influence of the seed must not be overlooked; though climate and soil can undoubtedly influence the composition and the quality of the grain, it must be remembered that quality is also an hereditary characteristic. This fact is illustrated by considering the inheritance of flour strength in wheat. It has been assumed that it is impossible to grow "strong wheats" in an unfavorable climate, and this assumption seems to be warranted by the fact that in England the growing of high strength wheats is notoriously difficult.

Biffen has recently shown, however, that while many of the imported high strength varieties diminish in strength when grown under English conditions, the variety, Red Fife, maintains its strength unimpaired. So far as Australia is concerned, it used to be supposed that our climatic conditions were such as to prevent the production of high strength wheats; but the creation by Farrer of such varieties as Bobs and Cedar have demonstrated the falsity of this view. The Home Grown Wheat Committee charged with the improvement of English wheat has ruled out of court the idea that strength in wheat is dependent solely on the climate. If strength in wheat were due solely to environment, the breeding of high strength wheats would have to be given up as a hopeless proposition. The results of the tests outlined in the foregoing tests serve as summaries of the milling and baking qualities of the different varieties grown at Longerenong and Rutherglen. It is not to be expected that definite conclusions would result from a single season's work. The repetition of the tests each season amplified by similar tests with typical varieties from moist Gippsland and the dry Mallee should eventually provide systematic information of considerable value.

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS.

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.								Potash.		Price asked for the Manure per ton.
						Water Soluble.		Citrate Soluble.		Insoluble.		Total.				
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
1162	Sulphate of Ammonia ..	Wischer and Co., Melbourne	..	20·20	20·00	..	..	.	..	..	..	..	..	..	..	16 0 0
1114	Potash Sulphate ..	Cuming, Smith and Co., Melbourne	..	..	..	..	..	.	.	..	.	..	..	52·23	52·00	14 12 6
1106	Superphosphate, O.S. ..	Australian Explosives and Chemical Co., Melbourne	8·08	..	..	16·50	17·00	1·25	1·00	3·27	2·00	21·02	20·00	..	..	4 7 6
1126	" "	" " "	8·13	..	.	16·45	17·00	1·50	1·00	2·75	2·00	20·70	20·00	..	..	4 7 6
1129	" "	" " "	11·08		..	16·45	17·00	0·87	1·00	1·18	2·00	18·50	20·00	..	..	4 7 6
1086	Superphosphate, Sickle ..	Cuming, Smith and Co., Melbourne	7·78	.	.	17·60	17·00	1·01	1·00	2·04	2·00	20·65	20·00	..	..	4 7 6
1101	"	" " "	9·64	..	..	18·47	17·00	0·79	1·00	2·00	2·00	21·26	20·00	..	..	4 7 6
1113	" "	" " "	8·92	..	..	17·65	17·00	0·51	1·00	1·72	2·00	19·88	20·00	..	..	4 7 6
1127	" ..	" " "	9·30	..	.	18·01	17·00	1·17	1·00	1·86	2·00	21·04	20·00	.	..	4 7 6
1136	" ..	" " "	10·28	..	..	17·69	17·00	0·96	1·00	2·31	2·00	20·96	20·00	..	.	4 7 6
1087	Superphosphate, No. 1 ..	Mt. Lyell M. and R. Co., Melbourne	9·16	.	..	16·87	17·00	1·22	1·00	2·38	2·00	20·47	20·00	..	..	4 7 6
1108	" "	" " "	8·97	..	..	18·78	17·00	0·28	1·00	0·39	2·00	19·45	20·00	..	..	4 7 6
1131	" "	" " "	11·10	..	..	18·62	17·00	0·37	1·00	0·37	2·00	19·36	20·00	..	..	4 7 6
1133	" "	" " "	8·00	..	..	18·14	17·00	1·05	1·00	1·85	2·00	21·04	20·00	..	..	4 7 6
1134	" "	" " "	6·70	..	..	19·00	17·00	0·80	1·00	0·69	2·00	20·58	20·00	..	..	4 7 6
1138	" "	" " "	7·91	..	..	20·79	17·00	1·00	1·00	2·08	2·00	23·87	20·00	..	..	4 7 6
1139	" "	" " "	10·15	..	..	16·87	17·00	1·24	1·00	1·25	2·00	19·36	20·00	.	..	4 7 6
1119	Superphosphate, Rohs ..	P. Rohs, Bendigo ..	11·29	..	..	17·98	16·85	0·06	1·70	0·29	0·45	18·33	19·00	.	..	4 12 6
1165	" "	" " ..	11·93	.	..	18·20	16·85	0·33	1·70	..	0·45	18·53	19·00	..	..	4 12 6
1094	Superphosphate, No. 1 ..	Wischer and Co., Melbourne	8·46	.	..	16·57	17·00	0·50	1·00	2·31	2·00	19·38	20·00	..	..	4 7 6
1105	" ..	" " "	9·96	.	..	17·19	17·00	0·90	1·00	1·78	2·00	19·87	20·00	.	..	4 7 6
1115	" ..	" " "	8·48	.	.	17·92	17·00	0·42	1·00	2·10	2·00	20·44	20·00	.	..	4 7 6
1128	" ..	" " "	10·29	..	..	17·12	17·00	0·42	1·00	2·62	2·00	20·16	20·00	..	..	4 7 6
1130	" ..	" " "	11·10	..	..	17·21	17·00	0·56	1·00	1·46	2·00	19·23	20·00	..	..	4 7 6
1137	" ..	" " "	7·76	..	..	17·21	17·00	1·25	1·00	2·58	2·00	21·04	20·00	..	..	4 7 6
1144	" ..	" " "	11·74	..	..	16·76	17·00	0·44	1·00	1·41	2·00	18·61	20·00	..	..	4 7 6
1146	" "	" " ..	11·88	..	..	17·10	17·00	0·55	1·00	1·05	2·00	18·70	20·00	..	..	4 7 6

1148	*Bone and Superphosphate, No. 1*	Australian Explosives and Chemical Co., Melbourne	7·70	1·70	1·50	10·15	8·50	1·64	0·50	9·02	9·00	20·81	18·00	..	..	5	12	6
1164	Bone and Superphosphate, No. 3	" " "	11·88	0·89	0·75	13·93	12 75	1·56	0·75	4·64	5·50	20·13	19·00	..	..	5	5	0
1120	Bone and Superphosphate	S. and F. *Bugg, Kyneton*	8·04	2·16	1·45	7·47	8·05	7·43	7·20	6·40	5·05	21·30	20·30	..	..	5	15	0
1088	Bone and Superphosphate, A	Cuming, Smith and Co., Melbourne	9·14	1·63	1·50	12·18	8·50	1·83	0·50	4·55	9·00	18·56	18·00	..	..	5	12	6
1093	" " "	" " "	9·18	1·44	1·50	12·55	8·50	1·52	0·50	4·43	9·00	18·50	18·00	..	..	5	12	6
1103	" " "	" " "	11·35	1·88	1·50	12·73	8·50	1·93	0·50	4·15	9·00	18·81	18·00	..	..	5	12	6
1132	" " "	" " "	11·40	1·81	1·50	12·30	8·50	1·94	0·50	4·24	9·00	18·48	18 00	..	..	5	12	6
1150	Bone and Superphosphate, No. 1	J. R. Elsworth, Ballarat	12·12	1·87	1·00	7·83	8·00	1·71	3·00	7·95	7·00	17·49	18·00	..	..	5	7	6
1107	Bone and Superphosphate	A. H. Hasell, Melbourne	8·50	1·13	0·80	10·03	12·75	2·25	1·25	5·78	5·50	18·06	19·50	..	..	5	4	0
1089	Bone and Superphosphate, No. 1	Mt. Lyell M. and R. Co., Melbourne	7·40	1·50	1·50	8·35	8·50	2·60	0·50	8·70	9·00	19·65	18·00	..	..	5	12	6
1092	Bone and Superphosphate, No. 2	" " "	6·68	0·86	0·75	14·50	12·75	1·30	0·75	4·20	5·50	20·00	19·00	.	..	5	5	0
1135	Bone and Superphosphate, No. 1	" " "	7·12	1·35	1·50	9·00	8·50	1·91	0·50	7·35	9·00	18·26	18·00	..	..	5	12	6
1147	" " "	" " "	8·67	2·54	1·50	9·37	8·50	0·87	0·50	9·01	9·00	19·25	18·00	..	..	5	12	6
1110	Bone and Superphosphate	P. Rohs, Bendigo ..	10·01	1·83	1·50	8·33	8·00	3·31	4·00	4·46	5·50	16·10	17·50	..	..	5	5	0
1091	Bone and Superphosphate, No. 1	Wischer *and Co.*, Melbourne	6·04	1·60	1·50	8·60	8·50	3·34	0·50	7·62	9·00	19·56	18·00	.	..	5	12	6
1095	" " "	" " "	5·46	1·48	1·50	8·75	8·50	2·52	0·50	7·90	9·00	19·17	18·00	..	..	5	12	6
1143	" " "	" " "	10·67	1·45	1·50	10·03	8·50	1·53	0·50	5·12	9·00	16·68	18·00	..	..	5	12	6
1140	*Dissolved* Bones and Superphosphate	Cuming, Smith and Co., Melbourne	8·06	0·65	1·00	19·70	10·01	0·45	3·88	1·55	5·48	21·80	19·37	..	..	5	10	0
1158	" " "	" " "	9·21	0·95	1·00	14·67	10·01	1·34	3·88	4·36	5·48	20·37	19·37	..	..	5	10	0
1152	Nitro Superphosphate ..	Mt. Lyell M. and R. Co. Melbourne	11·51	1·94	1·00	14·45	13·00	0·88	1·00	1·72	2·00	17·05	16·00	.	..	5	10	0
1161	" " ..	" " "	10·43	1·62	1·60	15·39	13·00	0·65	1·00	1·20	2·00	17·24	16·00	..	..	5	10	0
1100	Ohlendorff's dissolved Peruvian Guano	Gibbs, Bright, and Co., Melbourne	9·80	5·91	..	8·94	..	1·20	..	0·48	..	10·62	..	1·25	..	13	5	0
1121	A.N.A. Surprise Animal Fertilizer and Superphosphate	G. W. Pennell Braybrook	9·60	1·71	1·50	4·63	7·59	4·80	2·95	6·53	5·51	15·96	16·05	..	..	5	10	0
1122	A.N.A. Surprise Fertilizer	" " "	9·80	2·93	3·00	..	..	4·43	6·00	9·12	9·00	13·55	15·00	..	..	5	10	0
1167	Bone Fertilizer	J. Cockbill, Melbourne	7·94	4·33	3·50	..	..	2·96	3·50	14·04	14·75	17·00	18·25	..	.	5	10	0
1085	.. ..	Cuming, Smith, and Co. Melbourne	5·29	2·95	3·00	..	..	5·45	3·00	10·67	13·00	16·12	16·00	..	..	6	2	6
1102	" "	" " "	5·23	3·31	3·00	..	..	6·31	3·00	12·89	13·00	19·20	16·00	.	.	6	2	6
1153	" "	" " "	6·04	3·20	3·00	..	..	4·68	3·00	14·55	13·00	19·23	16·00	..	..	6	2	6
1157	" "	" " "	7·99	2·92	3·00	..	..	4·21	3·00	14·37	13·00	18·58	16·00	..	..	6	2	6
1169	" "	" " "	8·73	3·40	3·00	..	..	5·43	3·00	11·17	13·00	16·60	16·00	..	..	6	2	6
1090	" "	J. R. Elsworth, Ballarat	8·44	3·30	3·00	..	..	6·32	6·00	11·52	11·00	17·84	17·00	.	,	5	12	6
1096	" "	" " "	6·24	2·92	3·00	..	..	5·66	6·00	10·50	11·00	16·16	17·00	..	..	5	12	6
1149	" "	" " "	9·85	2·82	3·00	..	..	5·26	6·00	11·48	11·00	16·74	17·00	..		5	12	6
1159	" "	" " "	9·89	2·91	3·00	..	..	5·01	6·00	11·44	11·00	16·45	17·00	..	..	5	12	6

List Showing Results of Analysis of Samples of Artificial Manures collected in Victoria under the provisions of the Artificial Manures Acts—*continued*.

Label No.	Description of Manure.	Manufacturer or Importer	Moisture	Nitrogen.		Phosphoric Acid.								Potash.		Price asked for the Manure per ton.
						Water Soluble.		Citrate Soluble		Insoluble		Total.				
			Found	Found	Guaranteed.	Found	Guaranteed	Found.	Guaranteed	Found.	Guaranteed	Found	Guaranteed.	Found.	Guaranteed	
			%	%	%	%	%	%	%	%	%	%	%	%	%	£ s. d.
1202	Bone Fertilizer	J. R. Elsworth Ballarat	8·06	2·77	3·00	..	..	5·66	6·00	11·87	11·00	17·53	17·00	..	..	5 12 6
1201	*Magic Fertilizer, No. 1* ..	*G. Gardiner and Co., Geelong*	*8·44*	*1·88*	*2·00*	..	..	2·17	6·58	17·52	10·42	*19·69*	*17·00*	..	..	5 2 6
1168	Bone Fertilizer	Wischer and Co., Melbourne	8·70	2·84	3·00	..	..	7·66	3·00	12·08	13·00	19·74	16·00	..	..	6 2 6
1163	Leguminous Manure ..	Cuming, Smith, and Co. Melbourne	10·48	..	..	14·97	15·30	0·76	1·00	2·37	1·90	18·10	18·20	2·23	2·60	5 5 0
1110	Vine Manure, No. 6 ..	Mt. Lyell M. and R. Co., Melbourne	1·86	1·35	1·12	5·26	6·37	2·69	0·38	5·07	6·75	13·02	13·50	15·00	13·00	7 17 6
1097	Grass Manure	Wischer and Co., Melbourne	8·60	0·79	0·75	11·20	9·80	0·90	0·75	4·35	5·15	16·45	15·70	1·80	2·60	5 5 0
1200	Potato Manure	" " "	10·26	1·02	0·94	13·27	12·97	0·57	0·76	1·26	1·52	15·10	15·25	6·54	5·85	6 7 6

LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED IN VICTORIA UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACTS—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Price asked for the Manure per Ton.
								Fine.		Coarse.		
			Found.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
			%	%	%	%	%	%	%	%	%	£ s. d.
1125	Bonedust	J. W. Branch, Geelong ..	8·24	4 30	3 50	16·72	19·10	46·00	32·80	54·00	67·20	5 5 0
1170	"	T. Brown, Hamilton	8·45	3·40	3·15	21·10	22·00	48·00	33·00	52·00	67·00	6 0 0
1141	Bonemeal	Cuming Smith and Co., Melbourne	5·40	4·15	3·00	21·60	21·00	52·00	30·00	48·00	70·00	7 0 0
1117	Bonedust	J. N. Day, Bendigo	7·93	4·23	4·23	21·14	20·87	28·40	37·00	71·60	63·00	5 15 0
1160	"	F. W. Richards, Warrenheip ..	9·40	3·10	2·50	21·63	24·30	50·00	60·00	41·00	40·00	5 0 0
1109	"	P. Rohs, Bendigo	8·46	4·09	4·00	20·18	18·00	34·10	66·00	65·90	84·00	5 15 0
1166	"	" "	8·80	4·20	4·00	18·40	18·00	38·00	66·00	62·00	34·00	5 15 0
1142	"	Spriggs and Porter, Benalla ..	7·74	3·60	3·74	23·36	23·00	43·00	36·00	57·00	64·00	6 10 0

Government Agricultural Laboratory
Melbourne, 21st October, 1913.

P RANKIN SCOTT,
Chemist for Agriculture.

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE ARTIFICIAL MANURES ACTS.

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Manure per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	In-soluble.	Total.		
		%	%	%	%	%	£ s. d.	
Blood and Bone Fertilizer	Redbank Freezing Works	5·75	..	7·16	8·08	15·24	6 6 0	J. Cooke and Co., Melbourne

Description of Manure.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked for the Manure per ton.	Where Obtainable.
				Fine.	Coarse.		
		%	%	%	%	£ s. d.	
Bonedust	Marvel	3·74	23·00	36·00	64·00	6 10 0	Spriggs and Porter, Benalla

Government Agricultural Laboratory,
Melbourne, 21st October, 1913.

P. RANKIN SCOTT,
Chemist for Agriculture.

THE FLAVOUR OF BUTTER INJURED BY METALS.

The United States Dairy Division has been investigating the effect of the presence a small amount of iron or copper may have on the flavour of butter. They report that very small amounts of these metals in the cream cause certain undesirable flavours to increase in intensity during storage. These flavours are often designated as "metallic," "oily" or "fishy." Experiments were carried out using known quantities varying from 1 to 500 parts to a million parts of cream. The butter was stored and examined at intervals varying from 20 to 187 days. The most noticeable feature was the rapid development of bad flavours in the butter containing the iron. Butter made from cream which had stood in rusty cans developed a peculiar taste easily picked out. The influence of copper was even more marked than that of iron.

The work shows that if cream is kept in rusty cans or comes in contact with iron or copper during the process of buttermaking, it may take up iron or copper from rusty cans, exposed bolt heads or other metal parts of pasteurizers or churns in sufficient quantity to affect the flavour of storage butter.

While there is nothing to show that the nature of the flavour is appreciably changed, it does demonstrate very clearly that the rate of development of the undesirable flavour is greatly accelerated during storage by very small quantities of iron or copper.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913-14.

MONTHLY REPORT ENDING 14TH NOVEMBER.

The seventh monthly report of the above competition is as follows:—

The weather during the past month has been very unseasonable and varied greatly from last month. For the first week it was very wet and damp, then fine and warm conditions prevailed with increased temperatures. This lasted about ten days; then it became boisterous and stormy, followed by thunderstorms. On sixteen days of the month rain fell, registering from 7 to 30 points.

The output of eggs for the month was 9,110, as compared with 8,838 eggs last report, and the general average is better than the corresponding seven months of last year.

The leading pen, J. H. Gill (Pen 23) has now a grand total of 999 eggs: whilst C. J. Beatty (Pen 11) is second with a total of 921 eggs; the third, J. S. Spotswood (Pen 6), has 916 eggs to its credit.

Food.—The food was similar to last month. The birds are all healthy and looking well, and any birds where broodiness has taken place are marked with a special ring by Mr. Johnson, the Poultry Expert in charge, for guidance to the owner. In the case of Leghorns, he would advise breeders not to have them put in the breeding pen.

Rainfall for the month—229 points.

THIRD VICTORIAN EGG-LAYING COMPETITION, 1913–14.

Commencing 15th April, 1913.

CONDUCTED AT BURNLEY HORTICULTURAL SCHOOL.

No. of Pen.	Breed.	Name of Owner.	Eggs laid during Competition. April 15 to *Oct. 14.*	Oct. 15 to *Nov. 14.*	Total to date—7 *months.*	Position in Competition.
23	White Leghorns ..	J. H. Gill	838	161	999	1
11	,, ..	C. J. Beatty ..	760	161	921	2
6	,, ..	J. S. Spotswood .	753	163	916	3
65	,, ..	E. A. Lawson ..	760	146	906	4
48	,, ..	Thirkell and Smith ..	758	144	902	5
8	,, ..	E. H. Bridge ..	746	148	894	6
10	,, ..	T. A. Pettigrove ..	728	155	883	7
61	,, ..	Jno. Campbell ..	754	116	870	8
35	,, ..	Moritz Bros. ..	701	163	864	9
31	,, ..	W. G. Swift ..	715	148	863	10
7	,, ..	H. McKenzie ..	689	161	850	11
50	,, ..	A. H. Mould ..	693	152	845	12
34	,, ..	J. E. Bradley ..	690	153	843	13
21	,, ..	A. Ross	688	144	832	14
49	,, ..	M. H. Noye ..	678	143	821	15
20	,, ..	C. B. Bertlesmeier ..	649	165	814	16
66	,, ..	W. Featherstone .	658	151	809	17
40	,, ..	Geo. Edwards ..	651	154	805	18
32	,, ..	H. Hanbury ..	653	149	802	19
5	,, ..	G. W. Robbins ..	644	154	798	20
37	,, ..	C. H. Busst ..	667	122	789	21
26	,, ..	B. Rolls	635	145	780	} 22
2	,, ..	R. W. Pope ..	625	155	780	
41	,, ..	Percy Walker ..	621	151	772	24
58	,, ..	Stranks Bros. ..	615	154	769	25
24	,, ..	*Redfern Poultry Farm*	615	153	768	26
63	,, ..	A. Sellers	627	139	766	27
67	,, ..	C. Hepburn ..	599	162	761	28
43	,, ..	Morgan and Watson ..	627	133	760	29
46	Black Orpingtons	T. W. Coto ..	663	94	757	30
47	White Leghorns ..	W. McLister ..	613	131	744	31
13	Black Orpingtons ..	T. S. Dallimore ..	602	137	739	32
14	White Leghorns ..	F. Hannaford ..	587	145	732	33
38	,, ..	M. A. Monk ..	598	133	731	34
33	,, ..	South Yan Yean Poultry Farm ..	562	163	725	35
59	,, ..	Cowan Bros. .	593	128	721	36
45	,, .	D. Goudie	594	126	720	37
18	,, ..	B. Rowlinson .	568	144	712	38
42	,, :	A. Stringer ..	564	147	711	39
52	,, ..	W. G. Osborne ..	560	149	709	40
12	,, ..	A. H. Padman ..	541	159	700	41
62	,, ..	G. A. Gent ..	544	151	695	42
27	,, ..	J. Sinclair	550	142	692	43
3	,, ..	S. Buscumb .	567	119	686	44
25	Black Orpingtons ..	King and Watson ..	580	101	681	45
56	White Leghorns ..	Schaefer Bros. ..	531	147	678	46
22	,, ..	B. Mitchell ..	537	139	676	47
44	,, ..	W. A. Rennie ..	520	147	667	} 48
57	,, ..	Gleadell Bros. ..	515	152	667	
53	Black Orpingtons ..	A. Greenhalgh ..	529	129	658	50
54	White Leghorns ..	James McAllan ..	507	148	655	51
55	,, ..	*P. H. Killeen* ..	534	115	649	52
51	Black Spanish ..	W. H. Steer ..	504	136	640	53
36	White Leghorns ..	A. J. Jones ..	500	137	637	54
29	,, ..	S. Brundrett ..	474	155	629	55
30	Black Orpingtons ..	James Ogden ..	458	160	618	56
28	White Leghorns ..	E. Waldon	481	128	609	57
19	,, ..	W. H. Dunlop ..	470	123	593	} 58
64	Golden Wyandottes	C. L. Sharman ..	456	137	593	
17	R.C.Brown Leghorns	S. P. Giles	467	116	583	60
60	Black Spanish ..	Watson and Rushworth	426	143	569	61
15	White Leghorns ..	J. Shaw	419	114	524	62
4	,, ..	Jas. Brigden ..	391	130	521	63
9	,, ..	Sylvania Stud Farm	365	140	505	64
		Totals	38,198	9,110	47,308	

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.R.H.S., Principal, School of Horticulture, Burnley.

The Orchard.

Care of Young Trees.

The care of the young tree at this season of the year is one of the most important of orchard operations. A very considerable number of young trees has been planted out during the past planting season, and it is thought advisable to draw attention to this. Whatever care and attention are given to young trees will be amply repaid to the grower in after years, owing to the vigour, sturdiness, and other qualities thus imparted to them. It is a mistake to plant a young orchard, and, after cutting back the trees, to leave them practically to their own devices, other than following the usual methods of soil cultivation.

The trees, after the early summer cultivation and cleaning of the soil, should be mulched with straw, grass, or leafage of some description. This mulching should not be crowded around the stem, its object being mainly to create moist and cool soil conditions, and to encourage a free root establishment. The mulch material should be occasionally stirred, and no weed or grass growth should be allowed to accumulate amongst it. Where mulching material is not available, a very frequent earth mulch should be given, by constantly stirring the soil within a few feet of the young trees. In addition to mulching, it will be beneficial to spray the young trees with water wherever possible, particularly on hot or windy days. At such times, the transpiration of moisture from the foliage is very excessive and continuous, and a water spray is thus very helpful to the young trees.

Further, all unnecessary buds should be rubbed off, particularly on the main trunk: and all growths in the centre should be pinched back, so as to force as much sap as possible into the growths which will ultimately form the framework of the tree. Similar attention should be also given to grafted trees: although they may not need mulching to the extent that young trees do, yet the water syringings and disbudding work will be of great benefit to them.

Cultivation.

All orchard soils should be kept well worked during the summer months. It is very essential that these should have an abundant supply of moisture during the whole of the growing season. The transpiration from fruit and foliage is considerable at any time; but during hot and windy weather the amount of moisture which is required by a tree, and which is ultimately transpired from the tree, is very exceptional.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to retain or obtain sufficient for their nourishment; they then very soon wither and die. The soil around these should be kept well stirred; they should also be given a good straw

or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to keep up a good loose earth mulch during the whole season, and to keep down all the weeds and useless orchard growths.

PRUNING.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree, and to increase the development of new fruit buds.

SPRAYING.

Spraying with arsenate of lead for various pests will now be receiving attention. These include the codlin moth, cherry slug, root borer, looper caterpillar, and various leaf-eating insects.

The question of the number of sprays necessary to keep the codlin moth in check is receiving attention in various parts of the world, and the "one spray method" in the control of this insect is being considerably advanced. The "one spray method" has for its basis the indispensable requisite that the inner calyx cup of the very young apple shall be filled with the poison—the young larvæ seeking entrance therein will be killed by endeavouring to eat their way through.

If it could be shown that in Victoria the codlin moth laid her eggs invariably in the calyx, the "one spray method" would be of extreme importance. But it has already been noted that the moth with considerable frequence places the eggs on the side of the fruit, and also on the foliage; consequently, under such conditions, the "one spray method" would appear to show a weak spot.

The annual appearance of the moths is generally coincident with the blossoming period. If the blossoms are early, the moths will be early, and *vice versa.* This has been proved by the fact that for the last three seasons the moths have always been observed when the trees are in flower, showing that the same climatic conditions influence the moths as well as the trees. This year the moths were early, the blossoming being very early too, as a result of the warm, dry weather experienced in September. The first moth was captured on 30th September, and this is a fortnight earlier than any previous record. It will, therefore, be seen that, to be thorough and effective, the first spraying must be given as soon as, or shortly after, the petals fall; subsequent sprayings may be given as the apples expand. Early spraying has shown that not one per cent. of moth-infected apples is the result, while to delay spraying would allow of the entrance of the caterpillar, and heavy loss will follow.

Cherry trees should be watched for visitations of the pear and cherry slug. As soon as this insect appears the trees should be sprayed with hellebore or tobacco water. If there is no fruit on the trees, arsenate of lead should be used as a spray. The slug should not be allowed to defoliate the tree after the fruit has been picked. Loss of leaves at any season is weakening and injurious to the trees.

Vegetable Garden.

All weeds must be hoed out from the beds, and if these are at all abundant, they may be dug in as green manure, or they may be used for mulching the tomato, melon, marrow, or such plants. Tomato plants should be staked, and all lateral growths pinched out; they should now be well manured and well watered. If not manured, a good weekly watering with liquid manure is necessary.

Asparagus beds should be allowed to mature their growths, and all cutting should now cease. A top dressing of manure will be helpful to the crowns.

Potato and onion beds will require constant hoeing, and it may be helpful to break down the tops of the onions, so as to prevent a too vigorous growth of the top, for the formation of flower beds, and thus strengthen and increase the value of the bulbs.

The long runners and weak lateral growths of plants of the melon family should be pinched back, and liberal supplies of water should be given.

French beans, peas, lettuce, cabbage and cauliflower, &c., should now be sown, the beds being made moist and cool for the planting.

Flower Garden.

As frequently emphasized in the "Garden Notes," surface cultivation is very necessary at this time of the year. To secure a constant earth mulch, as friable as possible, should be the aim of every gardener during the hot months of the year. After every watering or rainfall, the surface should receive a good stirring.

The season has been a very favorable one for roses, and flowers have been produced in fine profusion. For the next two months the roses should have a rest from blooming, so that the autumn crop of flowers may be produced as fine as possible. Water may be almost wholly excluded during this period, provided that the beds or plants be earth mulched, or mulched with some light and non-stimulating material, such as grass or straw.

Late spring flowering bulbs should be lifted, and stored in a cool, dry place. It is advisable to allow the bulbs to become dry before storing them away, by leaving them on the surface and shaded for a day.

All annuals, biennials, and herbaceous plants, which are approaching the period of bloom should now be supplied with frequent supplies of water; and a mulching of well rotted manure will help them greatly.

Dahlias should now be planted out, making two or three plantings, extending to the end of the month. The young plants should be firmly planted in the soil; and, in order to prevent overcrowding when the plants are full grown, the plants should be spaced at least 3 feet apart each way.

Chrysanthemums will now require considerable attention; the weak and unnecessary shoots should be removed, and the remaining growths well staked. All side shoots should be removed as the plants mature. The soil must be kept cool and moist, but excessive or even abundant water must be avoided until the plant is well grown.

The sowing of seed for late flowers may now be made, especially of such plants as zinnias, asters, and winter flowering stocks.

13 JUN 1914

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide supply of succulent fodder, clean water, and shade shelter.

Pigs.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* sties should be given a plentiful supply of clean water.

Sheep.—Disturb sheep as little as possible during the summer, excessive movement means the subsequent clip is lessened in value, and the condition of the sheep decreased. Remember rams work mostly in the cool of the day and crossbred ewes are only now coming in season. The older the feed becomes the greater the necessity for salt. In wormy country salt should be available at all times. If any sign of dark, unhealthy discharge exists among sheep, drench at once, for unhealthy ewes and wormy weaners attract flies. Salt and Stockholm tar—one pint tar to the 2 cwt. bag of coarse salt—is a useful lick in wormy areas.

Poultry.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green feed; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

Farm.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

Orchard.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

Vegetable Garden.—Plant out all seedlings when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabbi, &c.

Flower Garden.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

Vineyard.—This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain or sulphuring in case of odium, that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

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The Index of Vol. XI. will be supplied with the first number of Vol. XII., viz., 10th January, 1913.